SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y.. as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

Vol. XLV.—No. 27. [NEW SERIES.] NEW YORK, DECEMBER 31, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

STATIONARY BEAM ENGINE.

One of the engines driving the machinery at the American Institute Fair was a fine beam engine, the exhibit of Thomas F. Rowland, of the Continental Works, Greenpoint, Brooklyn, N. Y. It is an automatic cut-off beam engine, having a diameter of cylinder of 15 inches and a length of stroke of 30 inches. At 85 revolutions per minute, 80 pounds initial pressure, and cut-off at one-quarter, it is rated at 90 horse power. The diameter of the fly and pulley wheel is 8 feet, and it has a 30-inch face. It weighs 11,300 pounds.

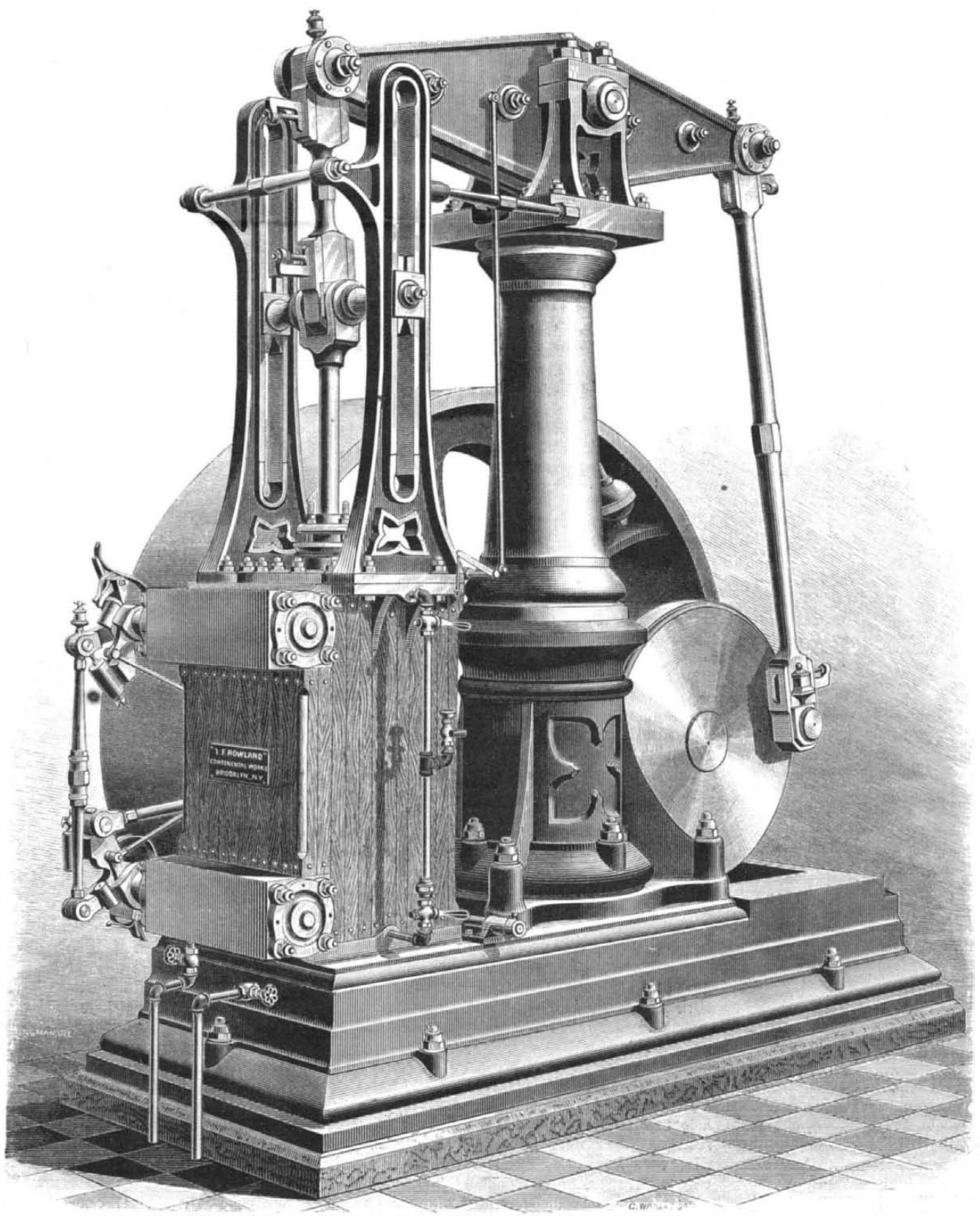
The engine is very strongly built, the cylinder, column, and main pillow block resting on a heavy bed plate. The beam is of wrought iron, neatly ornamented. The crosshead, fitted with brass gibs, is carried in cast iron slides. The crank shaft is of the best hammered iron; the piston rod, wrist pin, beam centers, crank pin, and all wearing journals are of steel. The valve levers, and bell cranks, and smaller parts of the cut-off gear are steel castings nicely finished.

The valve gear combines all of the advantages of an automatic cut-off gear generally, with the particular merits of the well known Corliss, and of other forms of valve gear of the disengaging type, with several points of special merit.

In this form of valve gear there are but two steam chests, from which the steam is admitted to and exhausted from the cylinder by means of a circular valve. The cut-off valve, also of the circular class, is located on the back of the main valve, and is operated through the hollow valve stem of the latter The main valves are worked by bell cranks which receive a positive motion from a single eccentric. The cut-off valves are operated by levers which move simultaneously with the main valve cranks during the forward stroke through the intervention of a pawl which engages with a projection on the cut off lever. This pawl is tripped, as in the Corliss gear, by means of a cam at a point of the stroke which is determined by the governor; the cut-off valve is at once closed by means of a spring attached to the main valve crank and acting upon the cut-off valve lever; a small air dash pot carried by the main valve crank serves to cushion the cut-off gear and prevents all undue jar. A fixed buffer stop arrests the motion of the cut-off lever as it travels with the main valve crank during the return stroke, and insures the proper opening of the cut-off valve and the re-engagement of its lever with the pawl at a definite point just previous to the beginning of the new stroke.

The power required to effect the cut-off is quite small, since the cut-off valve is balanced during the operation. The range of the cut-off is very liberal, and comes well within any demands that may be made upon it by variations in the load.

The entire valve gear is exceedingly simple and compact, and presents nothing that would make it liable to disorder. Engines with this form of cut-off have now been in continuous actual operation upward of two years. This valve gear is known as the Twiss Patent.



NEW BEAM ENGINE BUILT AT THE CONTINENTAL WORKS, GREENPOINT, BROOKLYN, N. Y.

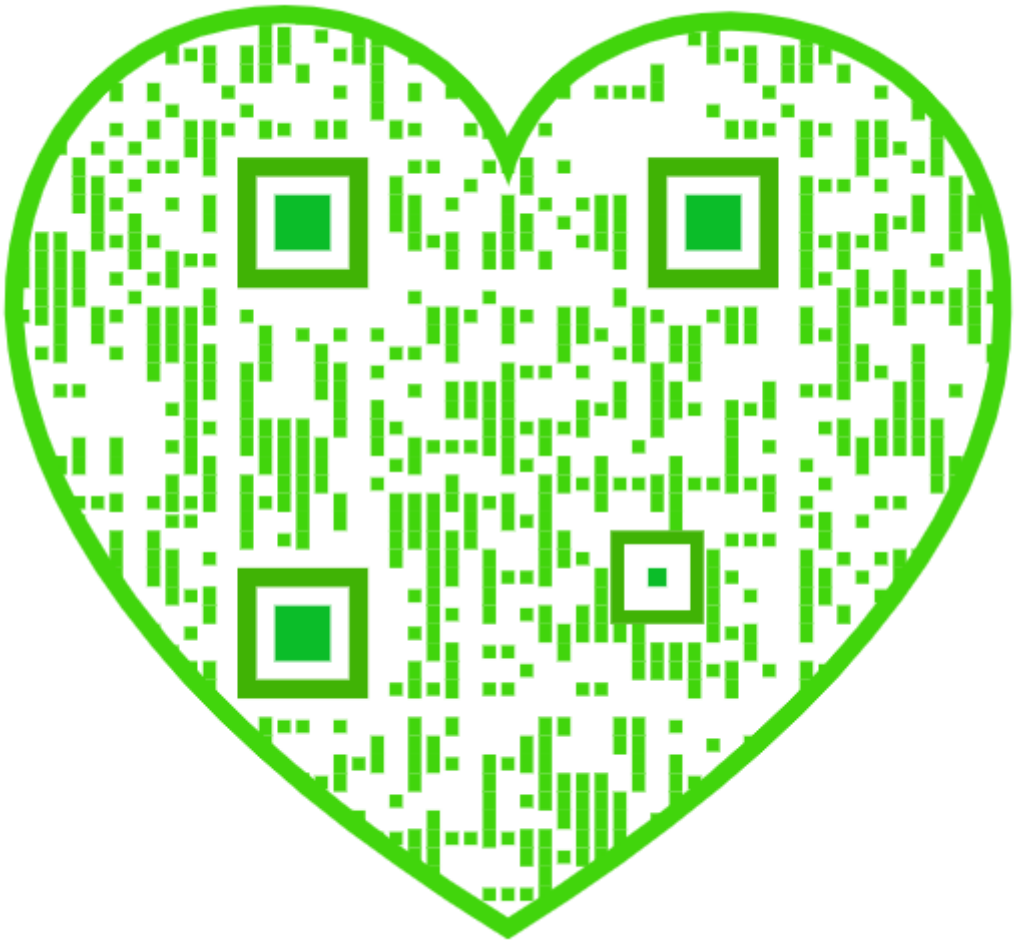
A New Source of Glucose.

A company has been formed in Philadelphia to manufacture glucose from cassava, the source of tapioca. As at present manufactured from corn, the average yield of corn being taken at 35 bushels to the acre, the glucose product is about 1,000 pounds to the acre. The yield from cassava is reckoned to be fully twenty times as great. The company's expectation will doubtless bear considerable paring down. They say that well-authenticated evidence is at hand to the effect that 20 tons of cassava to the acre is no unusual crop in Florida. This, at 56 pounds to the bushel, would give a yield of over 700 bushels per acre, or, at the rate of 30 pounds of glucose per bushel, would produce over 21,000 pounds of glucose per acre. A comparison of the yield of glucose from corn and cassava shows that 1,000 acres of corn yields about 500 tons of glucose; 1,000 acres of cassava yields about 10,000 tons of glucose.

New Method of Compulsory Alimentation.

When insane patients refuse to take food, Keppelmayer advises the following: The patient, being placed on a perfectly horizontal couch without pillow, one nurse holds the head, another the outstretched arms, and a third the legs. A soft rubber Jacques catheter No. 10, with large lateral opening near the tip, is well oiled, introduced through one nostril, and slowly and gently pushed onward as far as the pharynx. Here it usually meets with an obstruction. Without using any force, very gentle pressure is now exerted until an act of deglutition is excited by which the catheter is propelled into the stomach. These catheters are of such a length that, when the tip has entered the cardiac orifice, the other end hangs from four to six centimeters outside of the nostrils. A hard rubber canula having now been fixed in the projecting extremity, a syringe with a capacity of about half a liter, and filled with fluid food, is fastened to the canula and the contents slowly injected into the stomach, after which the apparatus is withdrawn. Should the manipulator lose patience when the catheter is obstructed at the entrance of the pharynx, and use undue force, the tip of the instrument is liable to deviate from the proper course, and suddenly makes its appearance between the teeth. This maneuver once acquired by a patient, subsequent attempts at catheterization will require particular patience and care in order to succeed. The chief recommendations of this method of forced alimentation are its simplicity and the impossibility of causing an injury during its execution. Keppelmayer also recommends the employment of large-sized soft rubber catheters, provided with a large, smooth opening at the tip for administering enemata.—*Med. Chirurg. Rundschau.*

© 1881 SCIENTIFIC AMERICIAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... **$3 20**
One copy, six months, postage included **1 60**

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO. 37 Park Row, New York.

NEW YORK, SATURDAY, DECEMBER 31, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions	422	New inventions	421
Alimentation, compulsory	415	Notes and queries	424
A new source of glucose	415	Organic matter in meteors	420
A phosphor-bronze steamer	419	Our foreign commerce	421
Automatic freight car brakes	420	Paris opera, telephone at the*	422
A quicksand section	421	Poisonous effects of metals	417
Car coupling, safety	416	Quicksand section, a	421
Coal, the formation of	423	Recent inventions	418, 419
Cold storage	417	Safety car coupling	416
Compulsory alimentation	415	Scien. Am. in the workshop	416
Ebony cabinet	423	Scientific American Supplement	416
Engine, stationary beam*	415	Stationary beam engine*	415
Expansion of water by heat	417	Steam, water in	419
Foreign commerce, our	421	Supplement, Scientific American	416
Glucose, a new source of	415	Telephone at the Paris opera*	422
Gold and silver in 1881	416	Testing a new magazine gun	419
Heat, expansion of water by	417	The formation of coal	423
Improved life-raft*	422	The world's cotton trade	417
Labor statistics	416	Umbrellas and pepper	416
Life-raft, improved*	422	Ventilation of long tunnels	420
Long tunnels, ventilation of	420	Wall paper, manufacture of*	418
Manufacture of wall paper*	418	Water in steam	419
Metals, poisonous effects of	417	What invention may do	417
Miscellaneous inventions	423	Why S. Fran. needs the st. buggy	417

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 313,

For the Week ending December 31, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Amateur Mechanics.—Metal spinning. 21 figures. Tools and examples.—Chasing and knurling. 28 figures. Tools and examples 4984

The Ravel Gas Motor. 2 figures (to scale).—Elevation.—Vertical section 4986

Mr. Lawson's Boiler Experiments at Pittsburg, Pa.—Detailed statement of theory, methods, and results. By T. D. LAWSON.—3 figures —Arrangement of boiler.—Experimental boiler explosion.—Fragments of exploded boiler 4987

II. TECHNOLOGY AND CHEMISTRY.—How English Operators Work Gelatine Plates. By J. HAY TAYLER.—Explicit directions for using gelatine in portrait photography 4990

How to Make Good Cider and Keep It. 3 figures.—Coring machinery.—Filter 4991

Potatoes and their Utilization. 3 figures.—Household apparatus for making starch, vinegar, etc 4991

Gas and Gas Making.—The future of gas.—Improvements in gas-making.—Practical advice to gas managers.—The care of meters, etc.—Presidential address of Samuel Dalziel, at Glasgow 4992

The Specific Gravity of Nicotine and its Behavior with Water. By J. SKALEREIT 4992

III. ELECTRICITY, ETC.—The Clerc and Bureau Sun Lamp. 2 figures.—Explanatory diagram of lamp.—General view of sun lamp.. 4988

The Real Inventor of the Telephone.—The rights of Philip Reis. 4989

A Manganese Battery. By J. ROUSSE 4989

IV. ART, ARCHITECTURE, ETC.—Bartholdi's Great Statue of Liberty. 1 illustration. Driving the first rivet 4983

Residence, Milford Manor Estate. Salisbury. 1 illustration. Perspective and plans 4990

V. MATHEMATICS.—Methods of Measuring Inaccessible Heights and Distances. By THOS. ED. CANDLER. 7 figures 4989

VI. GEOLOGY, MINERALOGY, ETC.—A Hill of Magnetic Iron in Mexico 4993

Schuylkill County Anthracite 4993

Geological Chart and Zoic Calendar of Creation. By HIRAM A. REID 4993

VII. ARCHÆOLOGY.—American Archæological Explorations in Asia Minor. Mr. J. T. Clarke's Excavations at Assos 4993

VIII. ASTRONOMY.—On the Formation of the Tails of Comets. By M. FAYE 4994

IX. RECIPES, ETC.—To Preserve Autumn Leaves 4989

Quick Process for Making Vinegar 4994

To Bleach Gutta Percha 4994

Etching on Glass 4994

Battery Carbon 4994

Court Plaster 4994

Glaze for Pottery 4994

How to Make Oxygen 4994

THE SCIENTIFIC AMERICAN IN THE WORKSHOP AND ENGINE ROOM.

It is a common practice among intelligent manufacturers and other employers of mechanics and engineers to encourage their men to read the SCIENTIFIC AMERICAN. Some go further and take care to insure such reading by presenting their foremen and other men in responsible positions with annual subscriptions to the paper.

The practice is politic as well as kindly. It is safe to say that no mechanic or engineer can read the successive numbers of the SCIENTIFIC AMERICAN for a year without receiving suggestions if not specific instructions touching the work he has in hand, likely to be worth to his employer many times the price of the paper.

Take for illustration the single series of illustrated papers on boiler explosions published during the current year. In each instance it has been the aim to discover, if possible, the exact conditions and causes which led to the disaster, and to set them forth in the description and the engravings so plainly that the most inattentive reader could not fail to receive useful suggestions, if not material information. The habitual consideration of the conditions and results of boiler explosions, on the part of men who have charge of boilers, must of necessity make them more critical of their own work, more cautious, and more intelligent, both in detecting signs of weakness in boilers and in pursuing a course calculated to preserve the integrity of the boilers in their care. In view of the necessarily limited personal experience of the majority of firemen and engineers with respect to the management of boilers, the practical value to them of articles like those referred to canscarcely be overrated, while their indirect value to the owners of such boilers in lessening the risks of disaster bears no comparison with the small amount of a year's subscription to the SCIENTIFIC AMERICAN.

It is well recognized that an important factor of the prosperity and peculiar excellence of the manufacturers of this country has been the superior intelligence and inventiveness of American mechanics, their fertility of resource, and promptness to meet new problems with new devices, the fruit often of a breadth of knowledge of what is going on in other branches of industry not common among the mechanics and artisans of other countries.

That American workmen are so little hampered by the narrow trade rules and customs which make the introduction of improved methods and appliances so difficult elsewhere, may be largely attributed to the more general custom here of reading for information, particularly industrial books and newspapers.

The part which the SCIENTIFIC AMERICAN has taken in this connection during the past thirty-seven years is one of which we have reason to be proud. For more than nineteen hundred successive weeks this paper has carried its freight of information and influence to every part of the land and to many foreign ports; and we do not believe that in a single instance has it been other than a messenger of intelligence and influence for good.

Thanks to its acquired position and the generous support of its numerous patrons, the SCIENTIFIC AMERICAN is able to set before its readers from week to week an amount of information and a fullness of engraved illustrations such as no other industrial paper can begin to rival.

SAFETY CAR COUPLINGS.

Our recent remark, that in spite of the two thousand patents on car couplings, there is yet an unsatisfied demand for an automatic coupler, is disputed by a correspondent. The trouble lies, he says, not in the lack of invention, but in the indisposition of the railway companies to adopt them, or even to consider their possible merits. He says: "So long as human life is as cheap as they (the railway comnies) figure it, there is no likelihood of any improvements being adopted to prevent the killing off or crippling of employes; and so long as they can call it 'carelessness' or 'accident,' they do not want a remedy, unless some one would change all their couplings in one night and without expense to the roads."

This is putting the case with a directness that will seem little less than brutal to the railway authorities; to those, however, whose lives are in daily, it may be hourly, peril in making up trains—a hazard that existing appliances might largely if not entirely obviate—our correspondent's statement of the case may not seem at all too severe.

Our correspondent adds: "When you talk with railway magnates about a change they say it is impossible, for the reason that the new coupler would have to be adopted by all the roads, and the change would cost too much and occasion great loss of time. It all simmers down to this: Human life is too cheap. From talking with those connected with railways, I do not think it would take them long to find something to fill the bill if they were compelled by law to make the change."

As mentioned in this paper last week, a hearing has been accorded the inventors and owners of automatic couplers by a Connecticut State Committee, whose report may greatly help to determine the fate of a bill before the General Assembly of the State, requiring the Connecticut railways to adopt some form of safety coupling. If the problem is as easy to solve as our correspondent thinks, a practical beginning may soon be made in compelling the use of such devices. If the adoption of safety couplings can be secured in one State, the value of legislative attempts to save the lives and limbs of train-men will be established, and other States will follow suit. The change may be delayed, but it must certainly come, and the longer the delay the greater will be the cost of it.

THE SCIENTIFIC AMERICAN SUPPLEMENT.

For the convenience of the readers of the SCIENTIFIC AMERICAN we give in this, our last issue for the year, a catalogue of some of the many valuable papers contained in back numbers of our SUPPLEMENT. Any of these numbers can be had whenever required, either by sending to this office or by ordering through a newsdealer. The catalogue embraces a most extensive range of scientific subjects; and, what is better than all, most of the papers cited contain recent information upon the matters of which they treat. Does any reader wish to inform himself as to the most recent progress in Mechanical Engineering? He will quickly be able to post himself by reference to the admirable address of Prof. R. H. Thurston, given in full in SUPPLEMENT 308, and that of Sir William Armstrong in 307. Does he wish to acquaint himself generally with the present condition of research in respect to Biology, Embryology, Anthropology, Geology, Paleontology, Geographical Discovery, Astronomy, Light, Color, Applications of Electricity, Economic Science, Education? Let him consult the recent address of Sir John Lubbock, given in full in SUPPLEMENT 301, copies of which he may obtain for a dime.

This catalogue is a minor exhibit of the astonishing advance which is constantly being made in scientific research and discovery.

Labor Statistics.

The third annual report of the New Jersey Bureau of Labor Statistics, just published, shows a fairly encouraging state of affairs. It shows that the average amount spent by workingmen in a year is $455.27, and the average amount earned $498.53, leaving an average saving of only $43.26 in a year. The expenses also include sundries, tobacco, liquor, physicians' and druggists' bills, and other similar items. The report says that the truck system—compulsory dealing with stores in which the employers have an interest—is nearly abolished in the State, and that nearly all the wages are paid in cash. The average number of hours per week during which labor is performed is sixty. During the past year there was a marked diminution in the number of days lost through inability to obtain work. The average was forty from this cause, while last year it was eighty-seven. The average from sickness was seventeen. Wages have also advanced in most occupations, the average for men this year being $1.78 as compared to $1.45 last year. A fact shown in the report is that a great many laboring men depend for substantial assistance upon their families; indeed, that nearly all wages-earners receive aid in this way.

Gold and Silver in 1881.

In his annual report just issued the Director of the U. S. Mint estimates the world's production of gold for the calendar year 1880 at $107,000,000, and of silver at $87,500,000. The consumption of the world in ornamentation, manufactures and the arts is estimated at $75,000,000 of gold and $35,000,000 of silver. The estimated circulation of the principal countries of the world is placed at: Gold, $3,221,000,000; full legal-tender silver, $2,115,000,000; limited tender, $423,000,000—total specie, $5,759,000,000; paper, $3,644,000,000, making the total circulation, including the amount held in Government treasuries, banks, and in active circulation, $9,403,000,000.

The production of gold and silver in the United States during the past fiscal year is put down as—gold $36,500,000, and of silver, at its coining value, $42,100,000—a total of $78,600,000. Manufacturers of jewelry and other articles and materials of gold and silver reported a consumption of over $10,000,000 in gold, and nearly $3,500,000 in silver. The Assay Office at New York delivered to the manufacturers during the year $5,700,000 of gold in bars and $5,100,000 in silver. Taken together they appear to indicate a consumption of at least $11,000,000 in gold and $6,000,000 in silver. The Director estimates that the special circulation in the United States at the close of the fiscal year amounted to $440,000,000 in gold and $171,500,000 in silver.

On the first of November, 1881, the amount of specie, including bullion, in the mints and assay offices, available for and awaiting coinage, was $563,000,000 of gold and $186,000,000 of silver—a total of $749,000,000.

Umbrellas and Pepper.

The umbrella trade grievously threatens the existence of the pimento plantations of Jamaica. An official estimate made in Kingston, last fall, reckoned that more than half a million umbrella sticks were then awaiting export to England and the United States. These sticks were almost without exception pimento, and it is not surprising to be informed that owners and lessees of pimento walks are becoming alarmed at the growth of a trade which threatens to uproot, in a few years, all their young trees. The export returns for the past five years show an average of 2,000 bundles of sticks sent out of the island annually in the ordinary course of trade, and the returns for the first three-quarters of 1881 show an export of over 4,500 bundles, valued at $15,000. When it is remembered that each bundle contains from five hundred to eight hundred sticks, each of which represents a young bearing pimento tree, the extent of the destruction may be realized.

© 1881 SCIENTIFIC AMERICIAN, INC

THE WORLD'S COTTON TRADE.

Statistics gathered by the Department of State, and soon to be distributed, make the cotton product of the several cotton-growing countries to exceed three and a half billion pounds a year. Of this amount there is furnished by the

United States	2,770,000,000	pounds.
East Indies	407,000,000	"
Egypt, Smyrna, etc.	269,000,000	"
Brazil	44,000,000	"
West Indies	16,000,000	"
Total	3,506,000,000	pounds.

The figures show that the United States produce nearly four-fifths of the cotton crop of the world, and we know that the yield is steadily and rapidly increasing. Its chief rival, though a long way behind, is as notably declining. In 1875 the area under cotton in India was 11,450,000 acres; in 1878 it was only 8,000,000. The yield to the acre in this country is nearly four times that in India.

According to an English authority, Mulhall ("Progress of the World," London: 1880), the value of cotton manufactures made by machinery is annually as follows:

United Kingdom	$561.170,000
United States	233,280,000
Germany	106,920,000
Russia	102,060,000
Other European countries	310,860,000
India	34.020,000
Total	$1,348,310,000

It is estimated that the number of yards of cloth made every year in the primitive way with hand looms exceeds that of machine-made goods. The hand woven cottons of China, for example, amount to over seven billion yards a year.

The latest trustworthy statistics of cotton manufactures obtained by the State Department show that the principal countries employ over one and a half million operatives, as follows:

	No. of Operatives.	No. of Spindles.
Great Britain	480,000	40,000,000
France	210,000	5,000,000
Germany	130.000	5,000,000
Russia	180,000	3,500,000
Other European countries	250,000	6,600,000
Total European	1,250.000	60,100,000
United States	181.000	10,900,000
India	80,000	1,250,000
Total	1,511,000	72,200,000

The American figures include some 10,000 overseers, clerks, mechanics, watchmen, etc. Deducting these, to place the estimates on an equality with those of Europe, the department finds that the English operative runs about 83 spindles, the American 64½, the French 24, the German 39, the Russian 19. Thus far it would seem that the English operative is more efficient than the American. This, however, is not true, as the following important facts will show: Every American spindle consumes annually 66 pounds of raw cotton, while every British spindle consumes only 32 pounds. Every American operative, therefore, works up about as much raw material as two British operatives, turns out $1.50 worth of goods to the British operative's $1 worth; and even in piece goods, where the superior quality and weight of the American goods are so marked, the American operative turns out 2¾ yards to the British operative's 2½. Moreover, the average price of British and American cottons exported during the year 1880, as given in the customs valuations of England and the United States, was as follows: Piece goods, plain—British, 5·52 cents per yard; American, 8·48 cents. Prints—British, 7·68 cents; American, 7·83 cents. This establishes the greater efficiency of the American operative. The difference in wages is somewhat against the American manufacturer in comparison with the English, but this is only to the greater benefit of the American operative. A comparison of wages of English and American operatives shows as follows: In Lancashire and in Massachusetts, per week: Spinners—English, $7.20 to $8.40; American, $7.07 to $10.30. Weavers—English, $3.84 to $8.64; American, $4.82 to $8.73. Average wages in Massachusetts of all employes: men, $8.30; women, $5 62; male children, $3.11; female children, $3.08. In Lancashire: men, $8; women, $3.40 to $4.30. Hours of labor in Lancashire, 56 per week; in Massachusetts, 60. Thus it is seen that, although English labor is somewhat cheaper than American, the greater efficiency of the American operatives and their longer hours of work equalize the whole question of labor, while the American operative is better paid than the English.

England commands the markets of the world, and is the only country, except Switzerland, that more than supplies the home demand.

The annual imports of cotton goods of the European countries are as follows: France, $21,000,000, against $11,500,000 exports; Germany requires 3,000,000 spindles more to supply her home demand; Russia imports $15,000,000, but it is probable that she will supply her home demand in a few years; Sweden, Norway, Denmark, and Belgium import $13,500,000; Holland exports $6,000,000 in excess of her imports; Switzerland exports $10,000,000 in excess of her imports, and is, besides England, the only European country independent of foreign manufactures; Spain, Portugal, and Italy import $20,000,000; Hungary, Greece, Turkey, and Roumania import $40,000,000. The present Asiatic, African, and Australian demand can be estimated by the exports of England to those countries plus the present comparatively small exports of the United States. Great Britain exports annually $310,000,000 worth of cotton goods, the output of 35,000,000 spindles, which is more than are run by all the other manufacturing nations combined. She exports to Asia annually $136,791,000, to Australasia $8,674,000, and to Africa $19,091,000.

The imports of cotton manufactures to the United States are nearly three times as great as the exports. In 1880 they were:

	Imports.	Exports.
Piece goods, plain	$1.020,000	$5,835,000
Piece goods, printed	1,180,000	2,956,000
Hosiery, shirts, and drawers	7,515,000	—
Jeans, denims	1,068,000	—
All other manufactures	19,146,000	1,190,000
Totals	$29,929,000	$9.981,000

For the fical year ending June 30, 1881, there was an increase over 1880 of exports to the amount of $3,589,869.

The excess of imports consists of fancy goods, in the production of which the English mills excel. In piece goods the American mills supply the home demand and are exporting every year greater quantities. In 1880 we imported only 9,466,000 yards of plain piece goods, and exported nearly 69,000,000 yards; of printed piece goods we imported 9,346,000 yards and exported 38,000,000 yards. The imports of print goods are confined to specialties.

The present inability of American cotton manufacturers to divide the markets of the world with Great Britain is due, in the opinion of the Department of State, to the following advantages enjoyed by the British manufacturers:

1. Possession of the world's markets.

2. The system which has belted the world with entrepôts, chiefly colonial, for the reception and distribution of English goods.

3. A steam marine that covers every sea and gives direct and speedy communication with every port.

4. Vast capital, enabling the manufacturers to keep large stocks on hand and to give long credit.

5. A far-seeing and far-reaching spirit which impels the manufacturer to continue trading even when he loses, until he tires out the opposition.

The remedy, plainly, is to follow the British example. But there is another fact that must be considered. Great Britain sends goods to Africa and sells them for 4·51 cents a yard, to India for 4·84 cents, to China for 5·26 cents. All these are, of course, adulterated goods. It is estimated that out of the $280,100,000 worth of piece goods exported from the United Kingdom in 1880 not more than $60,000,000 worth were pure goods. Pure American goods cannot compete with these adulterated English goods so long as the buyers prefer the adulterated goods at the low prices. The question comes up, Shall our manufacturers adulterate their goods or shall they persistently try to introduce pure goods? The consuls are almost unanimous in their opinions that after a fair trial can be had the people of Africa and Asia will prefer American goods at higher prices.

What Invention May Do.

The possibilities of science when applied to the industrial arts are so very great that careful people hesitate to state them for fear of exciting ridicule. So, in articles which have recently been published in London as well as in New York, a humorous turn has been given to some of the possible results of inventions in these days.

Were an Englishman of the time of Elizabeth to have been told that water would be supplied to every house by means of pipes, that a combustible gas would be distributed in a similar manner from a central reservoir, that messages would be sent across continents and under oceans in a few minutes, he would have set down his informant as a lunatic, or, at best, the very wildest of dreamers. The man of to-day would be quite as incredulous if told what inventions and applications of science may do for the people of 1981.

One writer ventures to predict that in the twentieth century electricity will accomplish marvels which now seem too absurd to seriously set forth. Chops and steaks will be cooked by electric sparks so as to make the Frenchman's *cotelette à la minute* a reality. The fruits of the earth will be multiplied enormously by the use of electric light behind colored glass. Fruits and vegetables will be grown all the year round, winter and summer, day and night, so that the field which now produces a hundred bushels of any product will yield ten thousand. We now cook our food, but take our air and water raw, and through these two elements come all the disorders and contagions which afflict humanity. In the future water will be distilled and prepared for human use, and thereby purified from all germs of disease, while air will not be breathed by human beings until it has been cleared of all noxious qualities, after which it will be admitted to the glass-covered streets and dwellings in which the man of the future will live. Houses and places of business will be situated in immense inclosed edifices, the air of which will not only be rendered wholesome, but delightful to the sense of smell. Summer and winter, so far as extreme cold or extreme heat is concerned, will be abolished, as the temperature can be controlled by artificial means, and all parts of the globe will become equally inhabitable. Day will have no attractions over night, for the artificial lights will be more pleasing than any which the great luminary of day can give us. Then, of course, the air will be navigated, which will help to change the appearance of the surface of the earth, for the great cities will then be situated on healthful hilltops, instead of on the insalubrious plains below. With the great motors shortly to be discovered, huge mountain chains which obstruct man's progress in any direction can be leveled, while the ice packs around the two poles can be liquefied and made navigable.

All this seems wild enough, but no doubt very great changes will occur. If food can be produced by improved methods, with less cost, the problem of poverty is solved. If machinery continues to replace hand work, the hours of labor must be shortened and its value increased; but to accomplish this, a social revolution will be needed by which labor-saving machines will be worked for the benefit of the laborer, and not in competition with him.—*The Hour.*

The Expansion of Water by Heat.

Herr P. Volkmann has in the *Annalen fur Physik und Chemie* compiled the results of Hagen, Matthiessen, Pierre, Kopp, and Jolly, on the expansion of water, and has obtained the following mean results for the volume and density of water at various temperatures:

Temp.	Volume.	Density.	Temp.	Volume.
0 degr. C	1·000122	0·999878	15 degr. C.	1 000847
1 "	1·000067	0·999933	20 "	1·001731
2 "	1·000028	0·999972	25 "	1·002868
3 "	1·000007	0·999993	30 "	1·004250
4 "	1·000000	1·000000	40 "	1 007700
5 "	1·000008	0·999992	50 "	1·011970
6 "	1·000031	0·999969	60 "	1·016940
7 "	1·000067	0·999933	70 "	1·022610
8 "	1·000118	0·999882	80 "	1·028910
9 "	1·000181	0·999819	90 "	1·035740
10 "	1·000261	0 999739	100 "	1·043230

Poisonous Effects of Different Metals.

BY CH. RICHET.

In the following investigation the poisons were not injected subcutaneously, nor were they introduced directly into the veins, but small fishes, weighing about ten grammes each, were placed in poisonous water, from which very satisfactory results were obtained. The method is a very convenient one, and yields very accurate data. The rapidity of death depends upon the degree of concentration, and the limit of its poisonous effect was taken as the amount of poison contained in one liter of water in which it was possible for the fish to live for forty-eight hours.

The different metals were employed in the form of chlorates; the nitrates were found to be much more poisonous; while most of the sulphates were not sufficiently soluble, and hence could not be used for these experiments.

No. of Experiments.	Metal.	Limit of Poisonous Effect.
20	Mercury.	0 00029
7	Copper.	0·0033
20	Zinc.	0·0084
10	Iron.	0·014
7	Cadmium.	0·017
6	Ammonium (NH_4)?	0 064
7	Potassium.	0·10
10	Nickel.	0·125
9	Cobalt.	0·125
11	Lithium.	0 3
20	Manganese.	0·30
6	Barium.	0·78
4	Magnesium.	1 5
20	Strontium.	2·2
5	Calcium.	2·4
6	Natrium.	24·17

Thus it will be seen that, according to the previous table, potassium chloride is 250 times as poisonous as sodium chloride.—*Chem. Zeitung*, v. 876.

Why San Francisco Needs the Steam Buggy.

To the Editor of the Scientific American:

Your correspondent, W. C. K., under the heading, "Steam Buggies," in the SCIENTIFIC AMERICAN of November 26, calls attention to a subject of special interest to the inhabitants of large cities. Everybody is aware of the intolerable horse nuisance, caused by keeping carriages, wagons, etc., standing in the public streets. It is safe to say that at least half the death rate of cities is attributable to this nuisance.

Here in San Francisco the stench arising from neglected filthy streets is simply awful. And this is for the most part caused by horses. There are only three streets in this city that are kept in anything like a decent condition: these are Market, Kearny, and Montgomery streets.

Were the streets of an Eastern city allowed to remain in the same condition as those of San Francisco the population would soon be decimated by smallpox and other epidemics. But here, owing to a constant strong breeze blowing from the ocean, the noxious vapors are carried off as fast as they rise. To this alone is owing the freedom of this city from epidemics, as the members of the Board of Health—if such a body exists here—seem to take no interest in the matter. Between the horses and the Chinese, San Francisco is fast assuming the characteristics of an Asiatic city. The man who will invent a motor substitute for horses will be a benefactor to the human race.

SANITARIAN.

San Francisco, December, 1881.

Cold Storage.

The increasing use of cold storage for perishable food stuffs, which are apt to be scarce at certain seasons, is one of the characteristics of the time. Last summer, when fresh eggs were plentiful and cheap, a gentleman in Chenango Co., N. Y., stored in a mammoth cooler some five thousand barrels of eggs. Now they sell in this city as "fresh laid" eggs, at a large profit. As the eggs are removed the cooler is filled up with ducks and other fowl to be sold next spring.

© 1881 SCIENTIFIC AMERICIAN, INC

RECENT INVENTIONS.

Messrs. John H. Houston and David H. Houston, of Cambria, Wis., have patented an improved hurdle for fanning mills. The object of this invention is to insure a more thorough separation of the grain and the chaff in a fanning mill Hurdles for fanning mills, as heretofore made, have been defective in the construction of the frames or slides of their sieves, which have been straight on their lower or inner edges, thereby not providing for a proper filling of the sieves at their sides and angles and permitting the light grain and chaff to drop through the hurdle among the clean grain. This is caused by the greater or more rapid movement of the grain in the middle than at the sides, whereby the grain passes down the sieve on a curved line or front. The present invention obviates this and causes the grain to pass down the sieve in a straight line, all the grain moving at the same rapidity and completely covering the sieve. This is effected by making the lower edges of the screen frames and feed slide concave. An upper sliding feed board thus constructed is arranged above the uppermost inclined sieve, also an inclined slide below the lower sieve, and whereby the grain is made to pass over the entire width of the sieve of the screenings box, thus more thoroughly cleaning the grain.

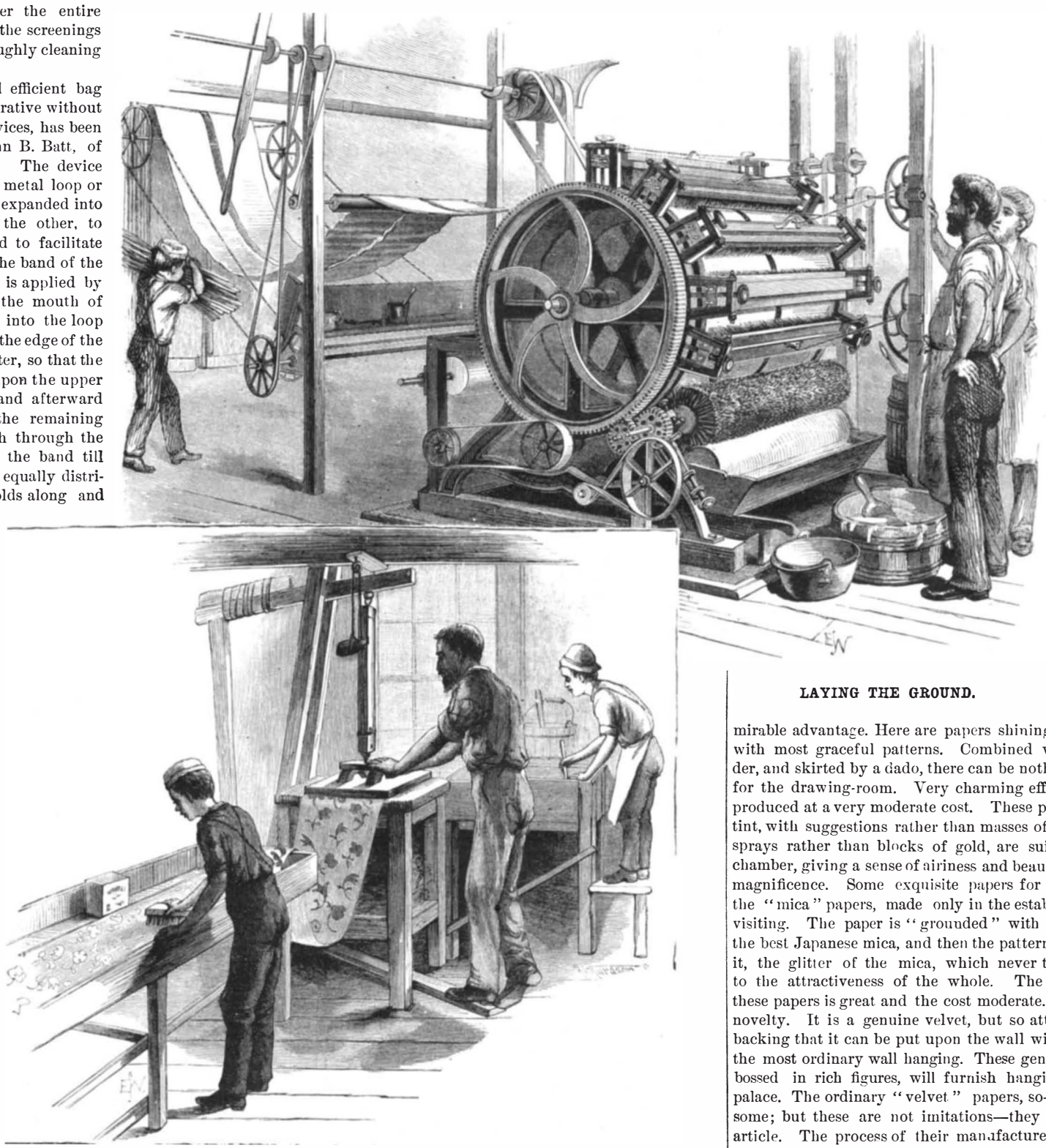
A very simple and efficient bag fastener, which is operative without the aid of locking devices, has been patented by Mr. John B. Batt, of Williamsville, N. Y. The device consists of an oblong metal loop or band. having one end expanded into a larger curve than the other, to serve as a handle and to facilitate the insertion within the band of the mouth of the bag. It is applied by drawing a portion of the mouth of the nearly filled bag into the loop and placing it against the edge of the smaller end of the latter, so that the hem of the bag rests upon the upper portion of the rim, and afterward gradually drawing the remaining portion of the mouth through the enlarged portion of the band till the entire mouth is equally distributed in gathered folds along and within the band, when the upper edge of the rim of the band will engage with the hem of the bag and prevent the mouth from slipping out. The device may be disengaged by emplying force to withdraw a small portion of the hem at the mouth end of the bag.

An improvement in cotton gins, which provides for the delivery of the cotton in a clean condition and for the easy running of the gin, has been patented by Mr. Joseph Kopfler, of Amite City, La. This invention consists in a combination, with the brush cylinder, of an open concave composed of a series of curved bars arranged transversely in the frame of the gin, the planes of said bars being set at an angle and inclined rearwardly with their ends highest, to cause the cotton to drift toward the middle of the machine. The cotton is carried over the rearwardly inclined bars of the open concave, each inclined bar forming an air eddy in the blast generated by the revolution of the brush cylinder immediately behind the bar, and carrying off the dirt. The invention also comprises a combination of reversely beveled friction pulleys for imparting motion from the saw shaft to the brush shaft of the machine, the frictional contact being maintained between said pulleys by a spring arranged within a socket bearing at the end of the brush shaft and adjustable by an outside screw to vary its tension.

A simple improvement in sewing machine needles, by which the needle can be threaded very easily and quickly even by those having imperfect eyesight, has been patented by Mr. Amos F. Gerald, of Fairfield, Me. The needle is formed with a slit extending from a little below the eye, along one side of the latter, and upward to a point above the part of the needle that works through the goods, where it passes out at the side of the needle, thus forming an inclined splint, which has its upper end set outwardly. A sleeve inclined at the inside of its lower end is fitted over the needle to receive within it the upper end of the splint. This sleeve, which has its motion in direction of the length of the needle, controlled by a pin and slot, is formed with opposite notches in its lower edge, so that to thread the needle it is only necessary to draw the thread across the splint and press it upward against the lower edge of the sleeve to slightly raise the latter, and so that the thread will enter the notches and pass over the point of the splint, after which it is drawn downward through the slit until it enters the eye of the needle.

Ordinary flowerpots or crocks are open to the objection that they do not prevent the surplus of water poured into them from dripping upon the flower shelf or floor, and produce dampness by water collecting under their saucers. They also are subject to rapid destruction by rust. These objections are remedied in the flower crock recently patented by Mrs. Amelia D. Polsgrove, of Catawissa, Pa. In this improvement the flower crock or pot is provided with a drip-tube at its bottom arranged to project down within a cup which is formed with a screw-collar that fits within a correspondingly threaded collar on the tube. Said crock is also preferably made or provided with a base arranged to sit within the saucer of the crock and to inclose and conceal from view the cup and its connections. It is likewise proposed to fit within the crock a removable metal lining terminating below in a tube which enters the drip-tube of the crock. This construction not only effectually removes the objections above cited, but admits of the ready transplanting or interchanging of plants from one crock to another by removing the metal linings containing the plants.

A safety device, in the shape of an automatic brake for elevators, etc., has been patented by Mr. Joseph H. Baird, of Oakville, Conn. The invention is especially applicable to elevators and hoisting machines, and its object is to prevent the rapid descent of the elevator in the event of the slipping or breaking of the driving belt. The invention consists of two pulleys, one fixed on the driving shaft of the elevator, and the other on a parallel counter shaft or stud, and a wedge held loosely in a socket with its point inserted between the pulleys and in contact with their faces, whereby a constant friction is created between said pulleys and wedge during the descent of the elevator. On the upward movement of the car the wedge is released from the pressure of the pulleys. The device is a simple one and not liable to get out of order.



BRONZING BY HAND.

THE MANUFACTURE OF FINE WALL PAPERS.

DADO, SCREEN, AND FRIEZE.

In our issue of November 26 we gave engravings illustrating a portion of the extensive manufactory of Messrs. Frederick Beck & Co., Seventh avenue, corner of 2 th street, New York city. We now give some particulars in regard to hand-made papers.

In the extensive warerooms of the factory are found almost endless varieties of pattern and color. Here are papers almost as thick as board, imitating stamped leather. They make a very elegant finish for a dining-room or library. Some of them cost $12 a roll—eight yards to the roll. But they are very durable. Some of these papers reproduce the effects of the old Venetian or Dutch leathers. Theireffect, with their quaint antique patterns, especially when used as a dado in an apartment finished with dark woods, is extremely rich. The same may be said of a similar class of papers which produce the effect of oxidized metals. They can be introduced in decorations to admirable advantage. Here are papers shining with gold, and with most graceful patterns. Combined with a rich border, and skirted by a dado, there can be nothing more fitting for the drawing-room. Very charming effects can thus be produced at a very moderate cost. These papers of delicate tint, with suggestions rather than masses of color, and with sprays rather than blocks of gold, are suited to the bedchamber, giving a sense of airiness and beauty rather than of magnificence. Some exquisite papers for this purpose are the "mica" papers, made only in the establishment we are visiting. The paper is "grounded" with a preparation of the best Japanese mica, and then the pattern is printed upon it, the glitter of the mica, which never tarnishes, adding to the attractiveness of the whole. The effectiveness of these papers is great and the cost moderate. Here is a real novelty. It is a genuine velvet, but so attached to a paper backing that it can be put upon the wall with the facility of the most ordinary wall hanging. These genuine velvets, embossed in rich figures, will furnish hanging suited for a palace. The ordinary "velvet" papers, so-called, are handsome; but these are not imitations—they are the genuine article. The process of their manufacture is a secret, but any one who wants his walls hung with real velvet can now obtain the article he needs, and the cost will not be disproportionate to the effect.

Here are found papers for the finest and most costly mansion, and papers for the little nest of a cottage; papers embossed, and stamped, and flocked, and gilded, and plain; papers with the sheen of steel, or with a surface of velvet fit for the robe of beauty; papers with French pat terns, with Japanese patterns, with American patterns, papers with flowers or birds that carefully simulate nature, and papers with conventional designs; papers suited to all the different apartments of a house; papers for ceilings, for screens; papers—beautiful ones, too—for twenty-five cents a roll, or even for less, and papers, as before mentioned, for twelve dollars.

The white paper comes into the factory from the paper mill in large rolls. It varies in weight according to the particular use to be made of it; much heavier stock is required, for example, for "leather" paper than for the ordinary wall hangings. The first step in the process of printing is what is called "grounding." This is applying a tint over the whole surface of the paper, and is done by the machine

LAYING THE GROUND.

© 1881 SCIENTIFIC AMERICIAN, INC

represented in the engraving. The color is applied evenly over the surface by a series of brushes, and then the paper is caught up in loops and carried by an endless chain over steam pipes, thus becoming dry as it slowly makes its journey of about four hundred feet. It is then reeled up and is ready for the printing. These grounding machines can carry two widths of paper simultaneously, so that the process is a rapid one. The "mica papers," to which reference has been made, are grounded in the same way as those in plain colors.

The next step is the printing. Our former article described the manner in which this is done by machinery. The annexed engravings show the operation of printing by hand. This is done in working off specimens, that effects may be determined and patterns fixed upon. It is done also in the production of special patterns, made to order, or in cases where the quantity to be printed would not warrant the expense of preparing the rollers for the machine. It is done also in those cases where the pattern is, as it were, built up by layer after layer of "flock," resulting in very rich effects. The process is clearly represented in the engraving. The pattern is cut upon a block of the width of the paper. This hangs upon a sort of crane, as shown in the illustration. The block is applied to a color sheet, and then is swung over and gently pressed upon the paper, the exact position being indicated by certain marks on the margin. The paper is moved along, there is a new application of color to the block and of the block to the paper, and so the work goes on. Of course but one color is printed at an impression. The same process must be repeated for each color, and therefore the work is slow compared with the machine printing. But the results are very elegant. The finest papers, the richest borders, and the like, are hand printed.

Some of the "leather" papers which we noticed in the wareroom have raised figures upon them. These papers, which are very thick and heavy, are stamped in a machine similar to other machines for the same general purpose. Some of the most gracefully elegant papers are embossed.

After the printing and gilding they are run through a simple machine, the essential parts of which are two rollers, an upper one of steel, engraved with the pattern desired—ribs, wavy lines, or reticulations of any kind—and a lower one of hard manila paper. With many patterns this embossing adds very materially to the effect. In some of the papers the gold or bronze, or other metal, is applied by hand. The portion to be bronzed is printed in varnish, as shown in the illustration, then it is liberally dusted over with the metal powder. When the superfluous powder is brushed off, the masses of gold, or silver, or bronze shine out, with the result of enhancing the beauty and effectiveness of the whole.

HAND PRINTING.

A Phosphor-Bronze Steamer.

A private trial trip of a steam launch called the Phosphor-Bronze, the property of the Phosphor-Bronze Company, Limited, London, lately took place in the Thames, off Westminster. This small vessel is built entirely of phosphor-bronze, and her length is only 35 feet, her beam being about 6 feet, and she attained a speed of 12½ miles per hour, which, considering her size, is a remarkable performance.

The chief object of the company in having so small a craft built was to test the rigidity of the phosphor-bronze sheet and angle pieces used in her construction, prior to having boats built on a large scale. The results have been beyond the company's expectation as regards rigidity and absence of vibration. As we understand, says *Engineering*, that the cost of phosphor-bronze boats will not much exceed those made of steel, and as the metal is not subject to corrosion like iron or steel, and also retains its value, we expect to hear soon of a further use of phosphor-bronze for steam launches, torpedo boats, etc.

Water in Steam.

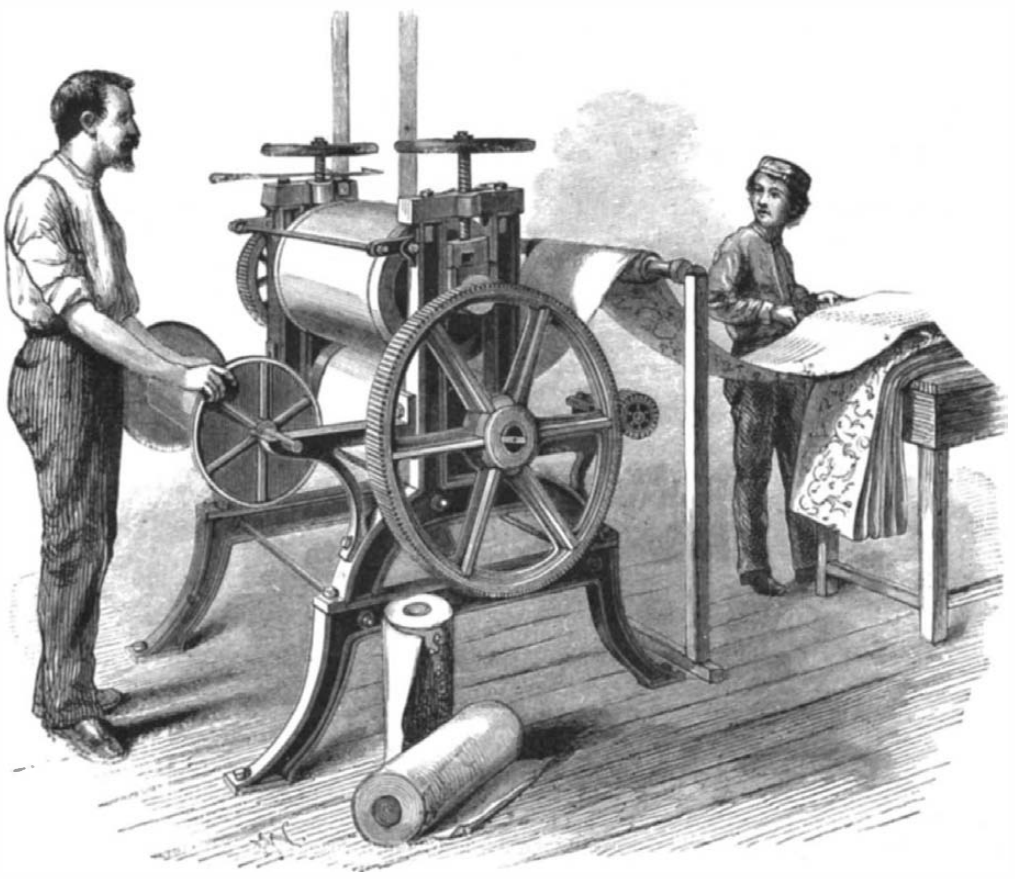
Herr Stoupler, of Lucerne, Switzerland, by adding fluorescine to the water of a boiler which by calorimetric tests enabled him to detect the presence of one half of one per cent of water carried mechanically out of the boiler by the steam, found that from 2·3 to 4 per cent was actually thus present in the steam.

The deep green color of the water in the boiler was retained in it for weeks, and yet no trace of coloring could be detected in the water condensed in the steam cylinder, a proof that the water which gathers there is entirely due to condensation caused by the expansion of steam, and that very little water is actually mechanically carried away by the steam from boilers.

Testing a New Magazine Gun.

The duplex field magazine gun was tried at Governor's Island the other day in the presence of General Hancock and a number of prominent officers and citizens.

The gun consists of two breech-loading rifle barrels, placed side by side in a brass case filled with water to keep them cool. The gun is operated by two men, one to feed and the other to discharge the cartridges, which is done by turning a crank. During the test 200 ordinary United States cartridges, 45 caliber, were first fired in 25 seconds. Then 100 were fired in 11¼ seconds, and at the third fire the barrels were emptied of 500 cartridges in 68 seconds. The gun rotates on a swivel, and can be raised or depressed at any angle.



EMBOSSING.

RECENT INVENTIONS.

Violinists will be interested in an improved chin rest for violins patented by Mr. Solomon G. Carpenter, of Chester, N. Y. This chin rest is made in the form of a cleat with a broad base and oppositely projecting horns. It is securely glued to the end of the violin just above the end block, and has a slot in it, through which the loop that is connected with the tail piece passes down to the end pin on which it is secured, and whereby the cumulative tension of all the strings serves to bind the cleat to the violin. The slot in the cleat is made deeper at its ends than it is in the middle, so that the sides of the loop are held always at their extreme limit of distance away from each other, and thereby more effectually hold the cleat against tilting strain caused by the chin of the player resting nearer one end of the cleat than the other.

An improvement in apparatus for treating minerals or chemicals with acids, and whereby large quantities of materials may be treated without repeated handling of them, has been patented by Mr. Amedee M. G. Sébillot, of Denver, Col. The invention consists in a basin for receiving the material to be treated with acid, which basin is surrounded and covered by a metal hood within a large stone or brickwork furnace having a fireplace on one side, so that the heat passes over the hood and heats the same and the materials in the basin below it. These materials are stirred during the operation by a rotating agitator, which is mounted on the lower end of a vertical shaft that can be raised or lowered at will, and is driven by suitable machinery. The materials are filled into the basin through a funnel or chute passing through the hood and the furnace, and the product of the operation is removed from the basin through a valve in the center of the same, which valve is operated from below, and permits the material to drop into a car which runs on tracks in a tunnel beneath the furnace.

An improvement in harness loop and trace carriers, by which the trace carrier is free from all projecting parts for the reins to catch upon, and whereby also it can be readily attached and detached by detaching the back strap from the loop or frame, has been patented by Mr. Robert D. Whittemore, of Chippewa Falls, Wis. The object of the invention is to facilitate and cheapen the manufacture of harness and provide a convenient means for carrying the traces. The invention consists in constructing a combined harness loop and trace carrier with a loop or frame having outer and inner bars upon the front, rear, and side parts to receive the harness straps, projecting pins upon its inner bars to hold the harness straps in place, and a rod having hooks formed upon its ends and a projection upon its middle part, whereby the cockeyes of the traces can be received and held, and are not liable to become accidentally detached, the cockeyes as they pass over the hooks causing the pressure of the back strap against the projection on the rod to force the ends of the hooks down against the loop or frame and to hold them there.

Mr. Michael Angelo McGuire, of Cincinnati, Ohio, has patented an improved trunk and valise frame. The object of this invention is to provide a frame for trunks, valises, satchels, etc., which is light and durable, and insures a good fit of the body and lid of the trunk or valise on each other. The frame of the body, and also the frame of the lid of the trunk or valise, is made of metal, shutting one down upon the other when the lid is closed, and each provided with a projecting rib on its inner surface. The leather, the edges of which rest against the ribs, is riveted to the inner sides of the frames and to inner metallic binding strips. The construction is a very serviceable one.

Mr. Benjamin O. Branch, of Friar's Point, Miss., has patented an improved broiler, which is simple, cheap, and efficient. The object of this invention is to provide an improved device for broiling meats, etc., in front of a fire, so that the articles broiled shall not be flavored by the smoke from the fire. The invention consists of a disk having straight pins projecting from its face for holding the meat to be cooked, said disk being pivoted so as to revolve vertically on an upright standard whose lower end is secured in a pan which is designed to

© 1881 SCIENTIFIC AMERICIAN, INC

catch the gravy; and it consists, further, in having a funnel supported above the disk for the purpose of delivering the butter, etc., for basting the meat during the process of cooking.

Mr. James M. Brooks, of Columbus, Tex., has patented an improvement in seed planters in which the reciprocating seed-dropping slide in the bottom of the hopper has arranged over it a brush which serves to prevent said slide from carrying out of the hopper any more seed than is necessary or proper, and which brush is held in place by two catches secured to the hopper and arranged to grasp the head of the brush. One of these catches is stationary, but the other is made yielding or elastic, so that it can be sprung back to allow the brush to be put in and taken out when required.

An improvement in running gear for wagons, which operates very effectually to distribute shock to the gear and to reduce jerking of the shaft or pole connections, when traveling over ruts or rough roads, has been patented by Messrs. John M. Wadlington and Daniel Grace, of St. Joseph, Mo. This improvement refers more particularly to that class of wagons in which both forward and hind axles are pivoted at their centers and connected by cross rods or chains, and it consists in providing a wagon having said pivoted axles and connecting cross rods, with hind hounds extending forward for some distance from the rear axle to which they are attached, said hounds carrying a cross stop rod, which acts, in combination with the reach, to limit the movement of the axles and to prevent any rising of the rear hounds from the reach.

An improved wash boiler has been patented by Mr. Augustus E. Carson, of Livingston, Iowa. This boiler is divided horizontally by a partition arranged at a short distance above its bottom, into a lower steam generating chamber, and an upper water and clothes-holding space. A pipe situated outside of the boiler connects the lower compartment with the upper part of the clothes-holding space above, and at its entry within said space is bent downward to deliver the steam and water from the compartment below down on the clothes. The water is kept circulating in this direction by a knee pipe connecting the bottom portion of the upper chamber with the interior of the lower one, at the opposite end of the boiler to that on which the before-named pipe is arranged. This knee pipe is situated within the boiler, and is fitted with a valve to prevent back circulation; also with a perforated guard to exclude the clothes from entering it. The clothes are held down in the boiler by a weighted perforated plate. A wash boiler thus constructed becomes an automatic steam washer, that rapidly and thoroughly cleanses the clothes.

Mr. Constantine L. Brady, of St. Louis, Mo., has patented an improved smoke flue, which is intended to take the place of the brick chimneys in frame houses and to be built in the walls of brick houses, or it may be inserted in the chimneys or smoke flues of houses already built. Said flue is made of sheet or cast iron, and is preferably square in cross section. Its lower portion is bent and presents an open end, which is inside the house a short distance above the floor, and may be closed by a sliding door. This lower portion forms a soot chamber, and said flue is provided at different points in its height with suitable stove pipe connections. Such improved flue is practically self-cleaning, and the soot as it collects in the chamber below may readily be removed.

An improved attachment for raising and lowering carriage or buggy tops, which may be operated with facility by the occupant of the vehicle from the seat thereof, has been patented by Messrs. Emanuel Fleck and John Boyd, of La Grange, Ind. The attachment comprises a hand lever pivoted to the end of the seat or railing, and provided with a pivoted locking lever having at its lower end an eccentric, which rests against the edge of a semicircular plate attached to the end of the seat or railing. To this hand lever a jointed lever is pivoted, which has its one end attached to a rod connecting the jointed braces of the buggy top. When the hand lever is turned toward the back of the seat the jointed braces will be folded and the carriage top lowered.

An improved car coupler, which is self-coupling, has been patented by Mr. Joel Ren, of Parrottsville, Tenn. The invention consists of a horizontal pincher-like pair of clamps pivoted above the draw-head of a car on a suitable support, with the long legs of the clamp extending forward and carrying a sliding ring, and the jaws or short legs directly above the coupling pin aperture in the draw-head in position for grasping the coupling pin; and, further, of a horn or a rod bent at right angles, fixed in and projecting from the end of an opposite car, whereby, when the cars approach each other, the clamp may be opened to release the coupling pin, that the latter may drop into the draw-head and hold the coupling link.

In adjustable dental chairs in ordinary use the crank arm or web requires to be frequently turned, and if left on the crank shaft it is constantly interfering with the movements of the operator in passing around the chair, and consequently the crank must be removed, to be replaced again for making any change in the adjustment of the chair. This frequent removal and replacement occasions much loss of time and inconvenience. This objection is overcome by an improved dental chair crank recently patented by Mr. C. Edmund Kells, Jr., of New Orleans, La., in which the crank arm or web is adapted to be rotated upon or around a pin which projects from the boss of the crank, and is capable of being set and held in any desired position in relation to the crank shaft without removing the crank, and whereby it may be turned entirely out of the way of the operator.

The Ventilation of Long Tunnels.

Herr Wilhelm Pressel has circulated a lithographed paper on this subject among his friends and colleagues; and as it is a question of daily increasing importance, we reproduce his most important suggestions. He begins by pointing out that the direction and intensity of the current of air in a tunnel are the product of numerous factors, that is, the length and dimensions of the tunnel, difference in level of the two mouths, average temperature in the tunnel, temperature of the external air at the mouths, pressure and moisture of the same, direction and strength of the prevailing wind. The effect of the latter group of factors may be either to intensify or to neutralize the natural action of ventilation set up by a difference between the level of the two mouths. The interior of a tunnel situated in a high mountain district, and passing under a vast mass of rock, will always be warmer than the outside air, especially at night, when in the Alps the temperature always falls. The warm internal air will, therefore, ascend the slope, and issue at whichever mouth is highest, and the cool air be drawn in from without to supply its place. Evidently this natural ventilation will be stronger in proportion to the difference of level of the two mouths. But the increase of this difference means increased steepness in the tunnel, and consequently increased production of smoke, and an intensifying of the evil to be cured. Moreover, as was before said, an unfavorable combination of external circumstances may destroy all the benefit to be derived from a steep gradient, and leave only the ill effects. This is the case at the Mont Cenis, where the difference is so great as 140 meters (nearly 460 feet), but where the natural current is from these causes extremely weak, and often fails to produce any through draught at all, the smoke merely shifting backward and forward, than which nothing can be worse. Nor has the mechanical ventilation succeeded in supplying the deficiencies of the natural. Herr Pressel states that the loss of power in the air-compressing machines is so great that, instead of sweeping out the tunnel, they barely succeed in sending their current sufficiently far into the interior to keep the refuge chambers for the employes clear of smoke; and the apparatus more lately erected for pumping out the vitiated air is very ineffectual. He therefore concludes that natural means are insufficient for the ventilation of long tunnels, and that mechanical means have failed, and proposes instead a system not hitherto tried. It is obvious that a current is caused by varying specific densities of air at various places, the heavier air being drawn along (popularly speaking) to take the place out of which the lighter has arisen. If then a distinct difference can be established and maintained between the specific gravities of the air at the two ends of the tunnel, a steady current can be relied upon. This may be done by condensing the air at one end or rarefying it at the other, or doing both together. The second plan has often been adopted. Shafts have been sunk into the tunnel at each end, and the air in one has been kept heated by fires, so that there was a continual indraught of outside air through the other. The objections to this method for long Alpine tunnels are, first, the expense of the apparatus and fuel when used on such a large scale; and, secondly, the radiation of heat from the walls of the tunnel itself, when this is pierced through an immense mass of rock, which makes it necessary that the air brought in should be not only pure but cold. The author proposes therefore to adopt the reverse process, and cool the air in one of the shafts by means of falling water. Railways always approach Alpine tunnels along high valleys, which invariably contain mountain streams of very low temperature. The means of refrigeration are therefore at hand. Herr Pressel considers that a stream of about one hundred gallons per second falling through the shaft would cool the air sufficiently and establish the current, for which he believes that a difference of temperature of ten degrees Cent. between the two shafts would be all that would be necessary. The upper openings of the shaft should be protected by revolving iron shields from the disturbing effects of wind on the ventilation. The mouths of the tunnel should be closed to allow this system to work properly, but need not be absolutely shut. Arrangements should be made for closing the shafts, and either wholly or partially shutting off the water supply, and there should be a special system of telegraphic signals for the purpose, so as to keep the whole system under control and enable it to be worked according to the varying conditions of the atmosphere. In very cold weather the supply shaft should be closed altogether, and the corresponding mouth of the tunnel opened, when the cold air will flow in of its own accord.—*Engineering.*

Automatic Freight Car Brakes.

After each war of passenger and freight rates between competing lines is over, and new figures are agreed upon, we notice that there is always a shrinkage in price from the previous rates which ruled before the war commenced. The question is naturally sprung: How are roads enabled to stand a continued reduction in rates? They pay no less for labor of any class nor for supplies of any kind. They have the same, or perhaps increased fixed charges to meet, and the same dividends to earn or to promise. How then can they make both ends meet, and submit to these successive cuts in prices? We answer that one very important reason is because of increased facilities every year arising from improvements in rolling stock, motive power, and roadway. Improved platforms and couplers, air and vacuum brakes, electric signals, paper wheels, safety switches, etc., permit increased speed with greater safety to their passenger trains, while heavier steel rails, better ballasted road beds, lessened gradients, and more powerful locomotives reduce the cost per ton per mile of moving freight trains. This latter cost will be still further very materially lessened as soon as a thoroughly practicable, independent, self-acting, automatic freight train brake shall have come into general use. Not only will the cost of moving of freight be lessened, but the immense losses by wrecks be greatly reduced by such an appliance. But it must be one that shall meet the requirements of railway freight management, namely, simplicity, durability, and cheapness, not only of first cost, but of cost of maintenance and repair.

What railway men want to-day is an automatic device in the form of a brake for freight trains, which shall produce the greatest results with the fewest number of pieces, which by reason of its simplicity shall require the minimum amount of care and attention, which shall be in all respects automatic and requiring no other connection between cars than the ordinary link and pin to make it effective, and at all times operative.

The more complicated and intricate the appliance, of course the greater the first cost and cost of maintenance. An automatic freight car brake which gives the engineer the control of his train when moving forward only, if simple, cheap, and durable, will always take precedence over a more extended and comprehensive device that would enable him to control it in moving backward also, for no train will ever be run backward at a speed which the engineer cannot control with his engine. It is the enormous loss of property, which is to-day the result of collisions, both head and rear, and the numerous, now unavoidable accidents incident to suddenly coming into danger while moving forward, with no means to check the heavy train going at even a moderate rate of speed except the unreliable appliances now in use, that railway managers are most anxious to save and avoid. They do not fear the accidents which may result from moving backward. This is the problem to be solved. How near are we to its solution? Every morning paper which we take up, with its record of loss of property and life, tells how badly such an improvement is needed.

Every railway manager is anxious to make his present freight equipment earn a greater income by shortening up the schedule of his freight trains, provided he could do it with any show for safety. Who has made any substantial, well authenticated developments in this direction? We have heard a great deal about trial trains, experimental stops, etc., with this or that device, but who can show results which have been obtained by constant service, even of a reasonable number of months upon a reasonable number of cars? Don't all speak at once!—*Railway Register.*

No Organic Matter in Meteors.

A Louisville (Ky.) paper reports an interview with Prof. J. Lawrence Smith, of that city, in the course of which Mr. Smith gave reasons for discrediting the discovery of organic substances in meteors, as claimed by Prof. Hahn, of Berlin. Mr. Smith said

"Although I have probably examined more microscopic plates of fragments of meteorites than any other person, still I have never discovered anything like organic remains in any of them. Besides, the well known chemical composition of these bodies is averse to the existence of any such remains as spoken of by Prof. Hahn. Were these remains present we should discern carbonate of lime on their interior. The two or three that have any carbonate of lime were discovered and analyzed by myself, and in these cases the carbonate of lime was an accidental constituent of incrustation deposited on the surface after their fall. In the microscopic examination of these polished plates of meteorites the two predominating minerals, enstatite and bronzite, will, by their fissures and forms, sometimes remind one of vegetable and other organic forms, but the merest tyro of an observer will trace here nothing but a rare resemblance. And, furthermore, the very ingenious nature of these minerals precludes the possibility of organic remains even in terrestrial minerals of similar kind. Not knowing of any eminent German geologist named Prof. Hahn, I thought it but reasonable and logical that I should inquire something about him from my friend Prof. Hawes, now in the employ of the Smithsonian Institution, and the best lithological microscopist in this country, and who recently returned to this country after ten years' study with Prof. Rosenbaum and others into the microscopic character of rock. In answer to my inquiries Prof. Hawes wrote me this letter:

"'I read that paper of Prof. Hahn's. He is a kind of half-insane man, whose imagination has run wild with him. These forms which he so accurately describes and figures have long been known to exist in meteorites, and have been frequently described by mineralogists and microscopists. They are mainly composed of enstatite or bronzite in radial forms, and fractured in such a peculiar manner as to give them the appearance of structure. Some of the American meteorites which I have examined show these forms in great beauty, but Prof. Hahn is the only man who has seen anything organic in them, and his paper has excited nothing but ridicule. It reminds one of the long and laborious research of a German professor who found a whole flora and fauna which he named with double Latin names, and which he found in his microscopic examination of basalt.'

"It is very clear to my mind," continued the Professor, "that these cranky observations, viewed with the spectacles of the imagination of Prof. Hahn, have obtained more publicity than they merit."

© 1881 SCIENTIFIC AMERICIAN, INC

NEW INVENTIONS.

An improvement in apparatus for preserving timber, by removing the sap and other volatile elements and supplying their place by antiseptic agents, without impairing the organic structure of the wood or changing its chemical character, has been patented by Mr. Joseph W. Putnam, of New Orleans, La. This invention relates to a vacuum apparatus, by which the wood is first subjected to a steam bath, the steam then condensed to produce a vacuum, and a comparatively high temperature maintained in the treating chamber during the production and continuance of the vacuum, and lastly, oleaginous and preservative material is admitted, under pressure, to supply the vacuum and permeate the pores of the wood. In this improved apparatus the treating chamber, and the storage tank located at a lower point, have combined with them a suction and force pump for the oil, and suction and discharge pipes, together with a supplementary oil tank, so that the oil is first passed by said pipes, one of which is circuitous, from the main tank to the treating chamber, by atmospheric pressure, and subsequently is forced in by the pump, and the latter afterward diverted to supply the supplementary tank, from which a more powerful force pump draws oil and ejects it into the treating chamber. This improved apparatus perfectly performs the work for which it was designed.

Mr. John M. Walden, of Fort Valley, Ga., has patented a very ingenious and improved cotton chopper. The object of this invention is to facilitate the chopping of cotton plants to a stand. In this machine two side bodies are connected with a central main body. Three or more knives are arranged in the forward ends of the central body to cut the crust of the soil and prevent it from being broken away by the chopping hoe. There are also plates projecting below the sides of said body which enter the soil and separate the plants to be chopped from the plants to be left for a stand, to prevent the latter from being torn away by the soil when operated upon by the chopping hoes. The side bodies of the machine are similarly provided with knives and side-plates. These side bodies are connected at their middle portions with the central body by hinged bars, and are further connected longitudinally with the front and rear portions of the main body and handles of the machine by bent rods. These several connections are adjustable to provide for the side bodies being set at a greater or less distance from the main body, according as more or less plants are required to be left for a stand, and so that the side bodies can be raised and supported above the ground. The hoes project below the surfaces of the several bodies far enough to enter the ground to the desired depth, and the side parts of the under side of the said bodies beneath and at the rear end parts of the hoes are concaved to allow the plants and soil to escape from the said hoes freely, and so that the plants left standing will be supplied with sufficient soil without being covered by said soil.

Mr. John V. Capek, of Brooklyn, E. D., N. Y., has patented an improved dynamo-electric machine. The invention consists in a dynamo electric machine having the field magnets formed of removable U-shaped iron cores fitting in plate iron casings, in the ends of which the concave magnet heads surrounding the armature, and connected by non-magnetic plates, are inserted, and which casings are surrounded by several layers of wires, the ends of each layer being connected with a plate, uniting the two coils in such a manner that all or any number of layers can be included in the circuit—that is to say, the wire or line of the exciting current can be so connected that more or less layers of wire are excited. The invention further consists in an armature formed of a series of U magnets attached to circular soft iron disks, and provided with segmental plates integral therewith or riveted thereto, and projecting from the middle of the outer surfaces of the magnets, where they are united, on each side of which central segmental plates the coils are wound, these coils being wound around sheet iron casings, which are slipped on the magnets. The invention further consists in brush holders formed of two forked segmental arms united at one end and mounted loosely on pintles, between which pairs of arms the brushes are clamped between two plates provided with pins passing between the forked arms, and secured by nuts, these arms being provided at the outer end with a transverse rod fitting in a fork on the commutator, whereby the pressure of the brushes can be regulated. The invention further consists in a spring plate in the ends of the brush holding clamp plates, and set screws for drawing them together and separating them, whereby the length of the part of the brushes resting on the commutator can be regulated. The invention also includes various improvements in the construction of details which, taken in connection with the features of invention above stated, assist in producing a dynamo-electric machine that is simple in construction, capable of being easily repaired or adjusted, and is very advantageous in its operation.

An improved press for baling hay, moss, cotton, etc., and which provides in a very efficient manner for compacting the bales, for tying them and for removing them from the baling chamber, has been patented by Messrs. Andrew Wickey and Albert A. Gehrt, of Quincy, Ill. In this invention the chamber in which the follower moves is distinct from but in line and connects with the bale chamber, which is of larger transverse dimensions than the follower chamber, whereby the follower has the advantage of pressing the material to be baled from a smaller into a larger space, and the shoulders formed at the junction of the two chambers serve to hold the material as the follower is repeatedly drawn back to admit new charges. The bale is thus built up gradually, and is more compactly formed than where a large quantity of material is pressed by a single movement of the follower. To carry out this method of working, the follower has its successive pressing actions given it by a cogged segment, which is operated from either end by an oscillating sweep, and meshes with a double-geared rack in pivoted connection with the follower, a spring applied to the follower serving to suddenly draw the latter back every time the rack passes its dead center on the segment. The press, which is horizontally arranged, is also provided with a pivoted and sliding reversible end piece to facilitate removal of the bale, and with longitudinally bisected tie tubes applied to the heads of said end piece and head of the follower to provide for the cording of the bales.

Mr. Homer H. Hunt, of Muscatine, Iowa, has patented an improved holder for bows for musical instruments. The object of the invention is to facilitate holding the bow of a stringed instrument in the position to insure neatness of execution and a fine and clear tone. The invention consists in attaching a thumb plate or bow holder to the bow or making it integral therewith. Said bow holder, which can be attached to the bow of any kind of stringed instrument, such as the violin, violoncello, etc., is formed with an under concave recess for the thumb of the player, the hairs of the bow touching the thumb nail. It relieves the player of all strain on his hand, and protects the hairs of the bow from being soiled or broken.

An improved fastening for neckties, which is simple and capable of ready application, and which serves to securely fasten together the shirt, collar, and tie, has been patented by Messrs. Emmet C. Standiford and John T. Todd, of Chrisman, Ill. In this fastening, which is designed to be used in conjunction with any collar button having a hinged or detachable outer head, a spring clasp having two leaves hinged together is applied to the tie, by securing the outer leaf to the back face of the bow over the inner end of the strap of the tie. The collar button is inserted in the buttonholes of the shirt and collar, with the hinged or detachable head outward and turned so as to lie in the plane of the shank of the button. Said head is then passed through a slot in the inner leaf of the clasp, and the strap of the tie passed around the neck of the wearer, and a hole in the outer end of the strap passed over the outer head of the collar button, which latter is then turned so that the heads of said button are parallel with each other, and the spring clasp closed.

An improvement in nut locks has been patented by Mr. Francis R. Hewitt, of Evington, Va. This invention relates to that description of nut locks in which a nut is provided with a spring and pin in its bearing surface, and so that the pin is made to engage with recesses in the washer for holding the nut in position. A leading object of the invention is to construct a nut lock which shall be adapted for use in combination with fish plates having elongated perforations for the bolts, to allow for expansion and contraction of the rails. The invention consists in a nut lock provided with a ratchet-faced washer, which has two opposite rectangular lugs struck up from its central portion on the edge of its central aperture. These lugs are inserted within the elongated sides of the perforation in the fish plate and prevent the washer from turning when the nut is screwed down. The invention also comprises a square-headed pin to engage with the ratchet-faced washer and keep the nut from turning.

A gong-bell of improved construction has been patented by Mr. George B. Owen, of Winsted, Conn. The object of this invention is to facilitate the attachment of gong bells to clock cases and other supports and give them a louder, clearer, and more musical tone. The gong is made in the form of a spirally-coiled wire, the coils being at such a distance apart that they will not touch each other when the said gong is struck by the bell hammer. The end of the gong is fastened to the central exterior portion of a sounder, which is made in the form of a circular plate with an inwardly projecting flange around its edge. A standard, screwing into an interior central hub of this sounder, connects the latter with the foot or base of the bell, which may be fastened to the back of a clock case or other support. Such standard is bent in its middle part into an arc of about three-quarters of a circle, and has its end parts bent inward to the central part of a circle, and then bent in opposite directions at right angles with the plane of the said circle, whereby the gong can be brought close to the foot or base that supports it without having its vibrations checked or its tone deadened.

A simple but useful improvement in cuff or sleeve buttons and studs, also applicable to studs for use in collar-bands, wrist-bands, etc., has been patented by Mr. Shubael Cottle, of New York city. This invention is an improvement in ornamental cuff or sleeve buttons and studs whose backs or shoes are constructed with a radial open slot to facilitate attachment and detachment of the same. In this improvement the shank is made hollow and provided with a vertical notch in its upper edge, or otherwise equivalently constructed, and the back or shoe has a central hole and radial slot coinciding with the notch. By this construction, in applying the button, one edge of the buttonhole is drawn into the center of the back, and thus crosses the end of the shank diametrically, instead of coming in contact with the side of the same and being pressed and turned outward. Thus the opposite edges of the buttonhole not being crowded so far apart, the button may be attached with greater rapidity and with less injury to the cuff and less rumpling or soiling of the latter.

Our Foreign Commerce.

The annual report of the chief of the Bureau of Statistics for the past fiscal year is packed with information. It shows the foreign commerce of the United States to have been for the year $1,675,024,318, and larger than in any previous year in the history of the country. The value of exports of merchandise amounted to $902,377,346, exceeded the value of exports during the preceding year by $66,738,688, and was considerably larger than in any previous year. The value of imports was $642,664,628, and was greater than that of any preceding year except that ending June 30, 1880. During the last six years the value of exports of merchandise has exceeded imports by $1,180,668,105. The excess of the value of exports over imports of merchandise during the last fiscal year was $259,712,718. The imports of specie exceeded the exports by $91,168,650. The value of exports of merchandise was $883,925,947, exceeding that of such exports the preceding year by $59,979,594, and were larger than in any previous year. The specie value of the exports of domestic merchandise from the United States increased from $428,398,908 during the year ended June 30, 1871, to $883,925,947 during the year ended June 30, 1881—an increase of $455,527,039. This increase was due mainly to the increased exports of breadstuffs, provisions, and tallow, cotton and manufactures thereof, live animals, leather and manufactures of leather, and wood and manufactures thereof. The increased value of the exports of these commodities during the fiscal year 1881, as compared with the fiscal year 1871, amounted to the sum of $374,059,476, and constituted 82·12 per cent of the increased exports of domestic merchandise, exhibited as follows:

Commodities.	Value of Exports during the year ended June 30.		Increase.
	1871.	1881.	
Bread and breadstuffs...	$79 381,187	$270,332.519	$190.951.332
Provisions and tallow....	41,870,254	158,328,896	116,458,642
Cotton and manufactures of.....	221,885,245	261 267,133	39.381.888
Animals living.....	1,019,604	16,412,398	15,392,794
Leather and manufactures of.....	1,897,395	8,088,445	6,191,050
Wood and manufactures of.....	12.916,542	18,600,312	5,683,770
Total increase..			$374.059,476

A Quicksand Section.

Underneath the surface of the ground, and directly overlying the rocky formation of the "Portage group" of rocks, contiguous to the falls of the upper Genesee River, in the towns of Genesee Falls, in Wyoming County, N. Y., and Portage, in Livingston County, is a stratum of quicksand of the most treacherous character, jeopardizing the construction of any public works that may be built thereon. The celebrated "slide section" of the Genesee Valley Canal, opposite the Middle Falls of the Genesee, has passed into history as the most expensive piece of earthwork ever maintained, not only in this State, but the United States. This section one mile in length, has cost more money than any twenty miles of the same canal between Rochester and Orleans. To maintain navigation upon this particular piece of work not only cost fabulous sums of money, but baffled the scientific knowledge of the engineering corps of the State, and to-day, but for the abandonment of this thoroughfare as one of the waterways of the commonwealth, the problem would still be a vexed question in the brains of the State officials.

To-day, upon the opposite bank of the river, but little to the westward, the New York, Lake Erie and Western Railroad have, in order to lessen a 40-ft. grade between Portage Bridge and the village of Castile, put in a loop line, which leaves the old road bed directly after crossing the bridge and passes over a deep ravine with an embankment about 80 feet in height, where it makes a sharp detour through a hill of quicksand, with a cutting of about 40 feet. The embankment at this point, which is made from the surplus material in the cutting, is about 600 feet in length. At the bottom of the ravine is a culvert, built upon pile foundations extending down to the rock. The superincumbent weight of earth upon this treacherous mass of natural earth has caused the whole to sink, while the lower material is making preparations to move down the ravine. Already, large forest trees have been carried downward toward the river bank, and fears are entertained that, as the soil becomes permeated with moisture, the whole embankment will slide out of position. The bed of the present track has moved far enough to take out the alignment of the curve, and the track repairers, who have raised the bank three times within as many months, have substituted a short tangent, to accommodate the running trains. The culvert in the new road bed has become to some extent demoralized, and information is now wanted how to hold the track to its original survey. When the new loop line shall have been brought into use, the vigilant care of the railroad officials, no doubt, will prove equal to the emergency, and before traffic is carried over this new line, measures both vigorous and remedial will be instituted.—*Buffalo Express.*

Success of the Elevated Railways, New York.

The travel over the elevated steam street railways of New York city for the month of October was the heaviest yet recorded, aggregating 7,121,961 passengers, as against 5,881,474 for the corresponding month of 1880, an increase of 1,240,487, representing just about the entire population of the city.

© 1881 SCIENTIFIC AMERICIAN, INC

AGRICULTURAL INVENTIONS.

In distributing attachments for plows for sowing seeds or fertilizers in the furrow formed by the plow, and in which a stationary hopper, a movable lower spout, and a subjacent shaking wheel have been arranged in rear of the plow standard, it has been a serious objection that said attachments were not adapted to distribute with the same regularity when traveling over hilly and horizontal surfaces. This objection has been removed in the improvement patented by Mr. Timothy C. Norwood, of Honea Path, S. C. In this improvement the hopper, the spout, and the agitating wheel are all connected by two and the same side bars, which, in their turn, are connected by links to the plow standard, whereby the hopper, spout, and wheel move together in parallel position behind the plow standard, and consequently maintain the same and proper relation to each other, under all varying conditions of the surface of the ground.

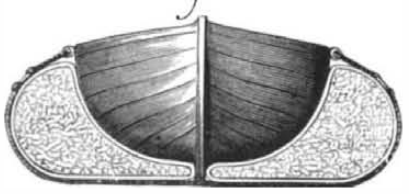
An improvement in seed planters has been patented by Mr. Charles P. Hanson, of Edwardsburg, Mich. The object of this invention is to provide an improved means of raising the openers of a planter from the ground and adjusting them to work at any desired depth. For these purposes the tongue of the planter is pivoted at its rear end so as to project above the main frame, and a slide bar extending back of the tongue is adapted to be thrown in contact with said end of the tongue by an adjusting lever operated by hand and provided with attachments for holding it in any desired position. By these means the tongue and frame may be set at any required angle of inclination with each other, and the openers, which are attached to the frame, be rapidly and easily adjusted or elevated.

An improvement in devices for separating grain from cockle and other small seeds, and for separating grain into grades, has been patented by Messrs. Martin B. Parker and Myron T. Smith, of Blue Earth City, Minn. In this device the grain is separated and graded during its passage down an inclined screen, and final delivery of the larger plump kernels over the lower end of the latter. As the grain passes down the screen, it is kept in contact therewith and prevented from bounding away from the screen by a series of flaps or aprons of rubber or other flexible material, arranged transversely over the screen. These aprons also serve to retard the descent of the grain, so that it may be properly separated and graded. The screen is prevented from sagging, and is kept up to the straight line of the lower edges of these aprons by longitudinal ribs attached to the frame and arranged under the screen cloth. This separator is a decided improvement upon other separators in use for like purposes.

IMPROVED LIFE RAFT.

The engraving shows an improved life raft recently patented by Mr. Thomas Hall, of Newton, Mass. It is designed to be carried on ships and steamboats, and consists of a double float or raft made of cork or other buoyant material, and of such shape that they may be fitted to the outside of the ordinary ship's boat.

Fig. 2



TRANSVERSE SECTION OF LIFE RAFT.

These rafts or floats are made in two parts, one being placed on each side of the boat, to which they are secured by suitable fixtures and lashings, as represented in the engraving.

When the parts of the raft are united they form a cradle or holder in which the boat rests, and the curved ends of the rafts are nearly in contact with each other at the bow and stern of the boat. While it is preferable to make the raft of such materials as can most readily be made to conform to the shape of the boat, straight cylinders or caissons may be used.

On board a ship or steamboat the raft and its included boat is carried on deck or hung from the davits in the usual manner, and when launched it takes the water without danger of upsetting. The boat may be filled with people, and the life lines will support a large number of those who are in the water, both being used simply for floating; or the lashings may be cut and the floats detached from the boat, which can then be rowed, with its passengers, to any desired point, and return to take off those who are clinging to the floats and the life lines.

THE TELEPHONE AT THE PARIS OPERA.

One of the most popular attractions at the Paris Electrical Exhibition is the nightly demonstration of the marvelous powers of the Ader telephone, by its transmission of the singing on the stage and the music in the orchestra of the Grand Opera at Paris, to a suite of four rooms reserved for the purpose in one of the galleries of the Palais de l'Industrie. This demonstration is given nightly between eight and eleven

FIG. 1.

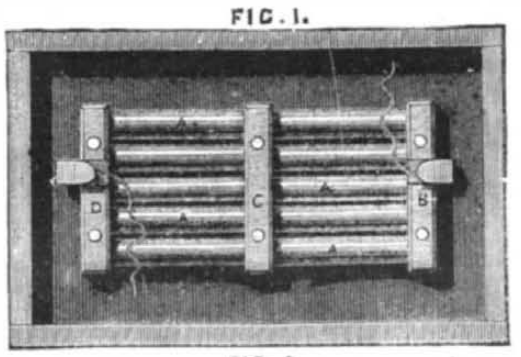
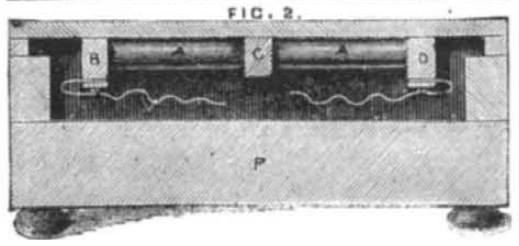
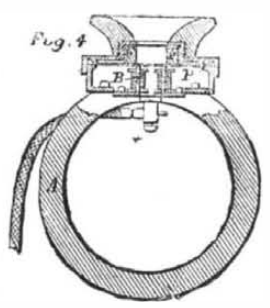


FIG. 2.



o'clock, and the enormous number of people who crowd the entrance to the building before the doors are open to the evening visitors rapidly resolve themselves into patient *queues* as soon as they can obtain access to the gallery adjoining the telephone rooms. There they patiently await their time for admission, and the privilege of hearing for a few minutes whatever may be going on at the opera—solo, chorus, instrumental music, or possibly all three, until the allotted time has expired, and the listeners have to give way for a fresh installment from the outside. In this way eighty telephones are constantly at work at the same time, at short intervals the communication being shifted to another set of eighty similar instruments in two other rooms. It may be remarked in passing that this distant audience of the performance at the opera enjoy their allotted moments of actual transmission and that interludes do not count. Certainly nothing has ever been done before so effectually to popularize science, and to render the masses familiar with the effect, however ignorant they may be of the cause, of this marvelous invention, the first feeble voice of which was heard in the Centennial Exhibition of 1876. Our contemporary, *L'Electricien*, publishes this week an excellent description of the installation at the opera and in the Exhibition, and from this we gather our information and illustrations on the subject.

Fig. 4



The transmitters are microphones on the Ader system, placed in front of the opera stage, close to the footlights and behind them. Figs. 1 and 2 are a plan and longitudinal section of one of these transmitters. Each consists of ten small carbon pencils, A A, arranged in two series of five each, and supported by three cross pieces, B C D, fixed to a small pine board, which receives the vibration and serves as a cover to the instrument. This board rests, as shown, in a massive block of lead, P, which in its turn is supported on four blocks of soft rubber. This arrangement is found to prevent any vibrations of the stage from being transmitted to the microphones, and the only movements taken up by the instrument are the sonorous vibrations of the air. The microphone is in connection with a Leclanché battery, and the wire of a small induction coil without any condenser. The line, laid in double wire, is connected on the one hand with the induction coil, and on the other with a series of telephone receivers placed in the rooms at the Palais de l'Industrie. There are eight receivers thus coupled to each transmitter. The undulatory induction currents developed in the fine wire of the induction coil by the variation in intensity of the current traversing the induction wire, react on the receiver. There are ten such installations as we have just described on the stage of the opera, each with its own battery and induction coil, and double line to the Exhibition. As the batteries become rapidly polarized, two sets are provided for each transmitter, and the batteries are shifted every fifteen minutes by a commutator. Fig. 3 is a diagram showing the arrangement, the transmitters being numbered one to ten; the batteries are shown at P, the induction coil at B, and the receivers in connection are marked A to H. Only two complete circuits are shown to avoid confusion.

The Ader receiving telephone, shown in Fig. 4, is well known; it is a magneto-electric instrument, the magnet of which is formed into a ring so as to serve as a handle (see A, Fig. 4). The two cores, B B, are attached to the poles, and have wires coiled round them; a soft iron ring, F F, is placed over the poles, and in front of the diaphragm. The object of this ring is to serve as a supplementary excitor, and its object is to give to the lines of magnetic force a direction perpendicular instead of divergent to the diaphragm; by this arrangement the variations produced in the magnet by the induction currents of the coils have a maximum effect on the diaphragm; it is to this arrangement that the clearness of definition of the Ader telephone is due.

M. Hospitalier, in the article from which we are drawing our information, refers to a peculiar property of the Ader telephone which we cannot do better than deal with in his own words: "We will now consider the new acoustic effect which Mr. Ader has discovered, and applied for the first time in the telephonic transmission at the Electrical Exhibition. Every one who has been fortunate enough to hear the telephones at the Palais de l'Industrie has remarked that, in listening with both ears at the two telephones, the sound takes a special character of relief and localization which a single receiver cannot produce. It is a common experience that, in listening at a telephone, it is practically impossible to have even a vague idea of the distance at which the person at the other end of the line appears to be. To some listeners this distance seems to be only a few yards, to others the voice apparently proceeds out of a great depth of the earth. In this case there is nothing of the kind. As soon as the experiment commences the singers place themselves, in the mind of the listener, at a fixed distance, some to the right and others to the left. It is easy to follow their movements, and to indicate exactly, each time that they change their position, the imaginary distance at which they appear to be. This phenomenon is very curious, it approximates to the theory

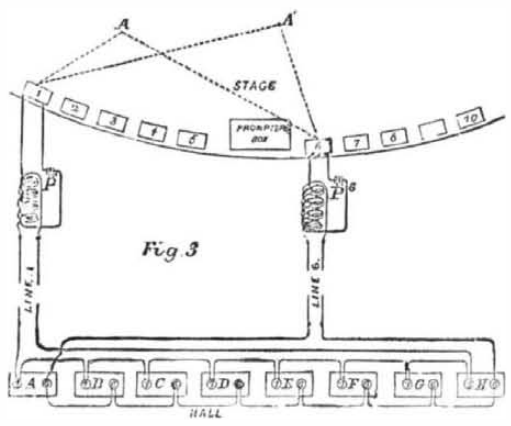
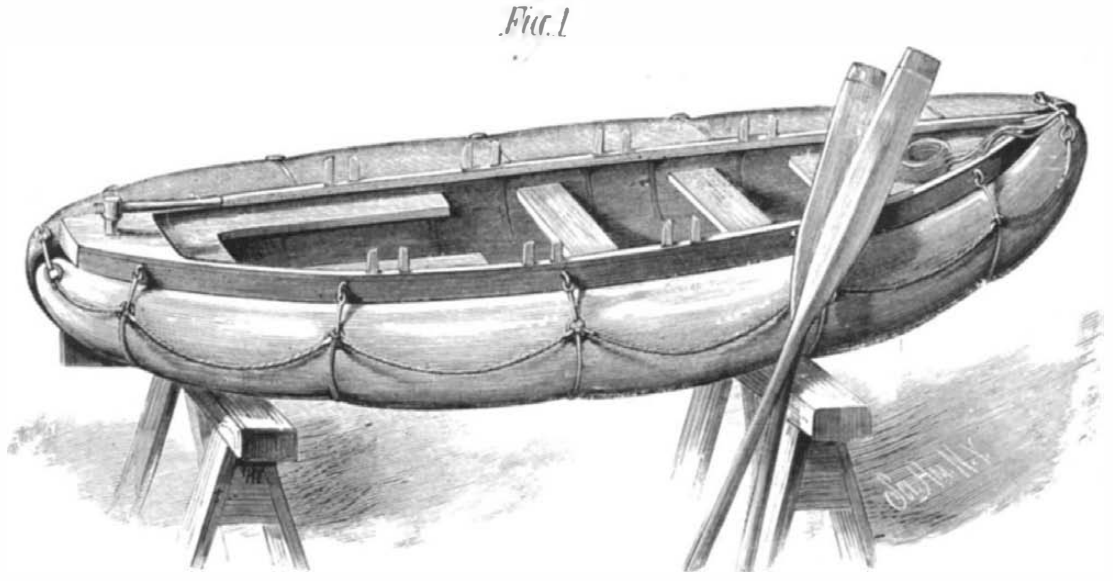


Fig 3

of binauriclar auduition, and has never been applied, we believe, before to produce this remarkable illusion to which may almost be given the name of auditive perspective. Having explained this phenomenon, we may consider its cause, which is a very simple one. In order to realize it, we may recall the stereoscope, which allows us to see objects in their natural relief. A similar effect is produced to the ear, and may be explained by referring to Fig. 3. Each person is placed in front of a transmitter with two telephones, which receive the impression from two distinct transmitters, placed a certain distance apart. These transmitters are grouped in pairs, 1 and 6, 2 and 7, 3 and 8, 4 and 9, and 5 and 10. Fig. 3 shows the complete arrangement for group 1 and 6. This group supplies sixteen telephones adapted for eight listeners, but the transmitter 1 serves the eight telephones on the left, and the transmitter 6 the eight telephones on the right of the eight listeners, A, B, C, to H. When the singer is at the point A, the transmitter 1 is more strongly influenced than the transmitter 6; the left ear is,

Fig. 1



HALL'S LIFE RAFT.

© 1881 SCIENTIFIC AMERICIAN, INC

therefore, more deeply impressed than the right ear, and the singer appears to be on the left to the eight listeners of the group. When the singer is at A, the transmitter 6 is more affected than the transmitter 1, and the singer appears to the right of the audience; these aural impressions change with the relative positions of the singers, and their movements can in this way be followed."

The use of the double conducting wire has been necessary to obviate the effect of induction, and in this respect it has been entirely successful, although of course it increases the cost of installation.

It may be interesting to note that experiments have been made to connect the Théatre Français with the Exhibition, but up to the present time these have not been successful, chiefly owing to the fact that the footlights create a powerful upward current and interfere with the vibrations to the transmitters. At the opera the footlights are closed at the top, and are burnt with a powerful down draught.—*Engineering.*

MISCELLANEOUS INVENTIONS.

An improved hermetically sealed paper package, admirably adapted for aromatic substances, such as spices, coffee, tea, also baking and yeast powders, and other materials injuriously affected by air or moisture, has been patented by Mr. Henry Clay Crocker, of Milwaukee, Wis. This invention covers both a process and the article produced by the process. The mode of procedure is as follows: A package is made of any desired kind of paper and is filled with the material it is intended to contain, and then sealed in the ordinary manner. The package is next steeped in a bath of paraffine, which effectually makes all the joints of the package air and water tight, and closes its pores. Such package is then inclosed by an exterior wrapper, which may be an ornamental one. Only clean paper, it will be observed, is next to the contents, and the paper being pasted before the paraffine is applied, a stable package is produced without bringing the contents in direct contact with the paraffine.

An improvement in siphons, which provides for their being charged or started automatically at a given moment, has been patented by Mr. James J. Powers, of Brooklyn, N. Y. The invention consists in providing a tank siphon with an automatic valve at its outer end, whereby on the water or other liquid reaching a given level in the tank, the weight of the liquid in the outer arm of the siphon will open said valve and the contents of the tank be discharged, the pressure of the liquid keeping the valve open as long as the flow continues, but the valve closing when the discharge ceases. To effect this action of the valve, it may be carried by a lever provided with an adjustable counterbalancing weight.

A very useful improvement in formers for making pulp pails has been patented by Mr. John W. Bartlett, of Grand Rapids, Mich. This improvement relates to conical formers upon which paper pulp pails are made. The object of the invention is to permit formation of the crease for receiving the bottom and the chine at the same time the pail is formed, and to permit removal of the pail from the cone without injury. The invention consists in an expansible head composed of adjustable segmental plates, which are provided with flanges that form the crease and chine of the pail, such expansible head being combined with a conical former, whereby the head may be expanded while the pail is being formed, and withdrawn to permit removal of the completed pail, without marring the crease or the chine.

An improved machine for fluting hair, moss, and other substances for upholstering, has been patented by Mr. James Taylor, of New York city. In this machine the material to be operated upon is dampened to make it flexible, and is spread upon a traveling feed apron, with its fibers longitudinal with the said apron. It is carried by the apron beneath a feed roller and up to and over a hollow heated fluted cylinder, and is pressed into the flutes of said cylinder by an endless chain of small rollers, arranged to fit the flutes for about one-third of the surface of the cylinder, whereby the fiber is fluted or corrugated and dried at one operation, and is delivered at the opposite side of the cylinder to that at which it was entered.

Mr. William A. Allen, of Jersey City, N. J., has patented an improvement in machines for sawing kindling wood. This invention is an improvement upon a former machine patented by the same party. In it the wood to be sawed is fed on to a slotted table and carried by hands attached to a series of traveling endless chains to a set of parallel circular saws which divide the wood as required. Arranged over the saws is a plate, sufficiently raised to receive the upper parts of the saws beneath it, and of a width equal to about the diameter of the saws, so that the stick of wood to be sawed may pass beneath the forward edge of said plate before coming in contact with the saws, whereby the stick will be inclosed between said plate and the hands when first struck by the saws, and will thus be prevented from jumping out of place. Furthermore, to the forward part of the lower side of this plate are attached springs, which pass back between the saws, incline downward to the table, and terminate a little beyond the rear edge of the plate, so that the stick of wood will be securely held until it has been severed by the saws and carried past them. These attachments greatly improve the machine.

An improved continuous furnace for treating ores has been patented by Mr. Amedee G. Sebillot, of Denver, Col. This improved furnace is designed to be used for treating ores, pyrites, and other minerals, and is to be used for roasting ores and minerals and converting them into sulphates, oxides, etc. The invention consists in a tunnel-shaped furnace with heat flues on the top and sides, and with rails on the bottom, on which rail cars rest, fitting closely in the furnace and containing the ore or the ore and acid, the fumes and vapors produced passing through a side aperture into a flue which conducts them into a suitable condenser. The car containing the fresh ore is subjected to the least heat, and when a car with fresh ore is introduced all the cars are pushed forward, so that the cars are gradually subjected to a greater temperature as the ores approach a complete transformation into oxides, etc. The invention also comprises a combination, in an ore furnace, with a series of cars having draught hooks, of a chain or rope, system of pulleys, and connected windlass, for passing the cars along and through the furnace. In a furnace constructed and provided as described, the waste heat that has acted on the first car acts on the contents of the other cars and but little heat is lost, so that the process may be conducted very economically.

Mr. William Driscoll, of Taunton, Mass., has patented an improvement in mechanism for finishing stoppers for steel ladles. The improvement comprises a block which is designed to be secured to a potter's wheel or other revolving device, and which is formed with a concave recess to receive the convex head of the stopper, that has a hole for the bore constructed to terminate in a shouldered recess in its base. Thus constructed, the stopper is placed upon a shouldered pin which fits said hole and recess, and is secured at its lower end by a screw to the block. Said pin in revolving packs and smooths and thus finishes the inner surface of the bore of the stopper, and the recess in the block packs and smooths and so finishes the convex head of the stopper. A lever formed with a socket to fit over an extended portion of this pin, and provided with a knife, is used to cut the rabbet in the base of the stopper. These several devices perform their work accurately.

EBONY CABINET.

The engraving represents an ebony cabinet of great beauty made by Herr Türpe, of Dresden. It is an example of the highest order of art manufacture. The bass-reliefs are of pear wood, and the sculptured figures are the work of a master hand.

EBONY CABINET MADE BY TURPE, OF DRESDEN.

The Formation of Coal.

All attempts to explain satisfactorily the formation of coal have thus far proved unsuccessful, though it is generally understood that it is the product of the decomposition of vegetable matter. Just how that decomposition has been brought about chemically is a matter which chemists have not as yet been able to solve. The principal difficulty has been that it has been impossible to obtain a clear insight into the chemical constitution of coal. It has been thought hitherto, and this is still the popular belief, that coal is in the main pure carbon, mixed with varying quantities of bituminous substances. It has been generally believed that, as the product of the distillation of coal is principally carbon, it would be safe to conclude that free carbon actually does exist in coal. The fact that sugar, starch, etc., under similar circumstances, leaves a residuum consisting of carbon has never been considered a proof that that element existed in these bodies in a free state. It is well known that coals which may have the same percentage of carbon, hydrogen, and oxygen do not by any means, in coking, yield the same products of distillation, and we have a complete analogy for this in the behavior of cellulose and starch when subjected to distillation. Evidence points to the conclusion that coal is a mixture of many and complex compounds; and the difficulty, amounting almost to an impossibility, of separating these compounds has much to do in rendering a chemical solution of the questions involved in the formation of coal a very arduous task.

The production of coal by artificial means is met by great obstacles, among which the absence of all knowledge concerning the conditions under which that process actually took place is the principal one. The question whether the vegetable matter to which our coal veins owe their origin was amassed by drifting or was carbonized *in situ*, has been much debated, and there has been much discussion on the point whether it was obtained from water or from land plants. Dr. Muck, of Bochum, in a recent work to which we shall refer at greater length in the future, takes up the theory that algæ have mainly contributed to the formation of coal. It is urged that the remains of marine plants are rarely found in coal veins, and that shells, etc., are not often met with. Dr. Muck calls attention to the fact that marine plants decompose easily and completely, losing their form entirely; and that the disappearance of the calcareous remains of mollusks is readily explained by the formation of large quantities of carbonic acid gas during the process of carbonization. In accepting the marine origin of coal it is not necessary to resort to the assumption of immense pressure and high temperatures to explain decomposition and the total destruction of the structure of the original substance Dr. Muck combats Fremy's bog theory at length. His views are well supported by recent investigations made by Herr P. F. Reinsch, who has examined 1,200 sections of coal, coming to the conclusion that that mineral substance has not been formed by the alteration of accumulated land plants. Herr Reinsch claims to have discovered that coal consists of microscopical organic forms of a low order of protoplasm; and though he carefully examined the cells and other remains of plants of a higher order he computed that they have contributed only a fraction of the matter of the coal veins, however numerous they may be in some instances.

DREDGING IN BARBADOS.—It will be seen by reference to an advertisement in this paper, that the Colonial Government, Barbados, ask for proposals for an extensive amount of dredging in the harbor of that island. Over five acres are to be dredged.

© 1881 SCIENTIFIC AMERICIAN, INC

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

AUGUSTA, GA., Nov. 9, 1881.

H. W Johns Manufacturing Company. New York.

GENT.: We have used your patent Asbestos Roofing on our buildings for six years, and find them to-day apparently good for as many years more. On the roof of our burner-room the Roofing has been constantly subjected to the fumes of burning sulphur, and has given us every satisfaction. Tin subjected to the same usage became worthless in less than a month.

C. B. F. LOWE, Supt. and Chemist.

The Constant Current Cure.—A rational, well tried cure for chronic diseases. Send for pamphlet to Constant Current Cure Co., 207 Main St., Buffalo, N. Y.

John A. Brashear, Manufacturer of Silvered Glass Reflecting Telescopes and Specula, No. 3 Holt St., Pittsburg, South Side, Pa.

Combination Roll and Rubber Co, 27 Barclay St.' N. Y. Wringer Rolls and Moulded Goods Specialties.

Send for Pamphlet of Compilation of Tests of Turbine Water Wheels. Barber, Keiser & Co., Allentown, Pa.

Metallic Letters and Figures to put on Foundry Patterns, all sizes. H. W. Knight, Seneca Falls, N. Y.

List of Machinists in United States and Canada, just compiled; price, $10. A. C. Farley & Co., Philadelphia.

Lightning Screw Plates and Labor-saving Tools, p. 380.

For Sale.—1 Engine Lathe, Fitchburg, 7½ ft. x 15 in.; price, $250. 1 Iron Planer, planes 7½ ft. x 34 in. x 30in.; price, $550. Address Concord Axle Co., Fisherville, N. H.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Telegraphic, Electrical, and Telephone Supplies, Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires, Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Clark & Heald Machine Co. See adv., p. 413.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Cope & Maxwell M'f'g Co.'s Pump adv., page 398.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Saw Mill Machinery. Stearns Mfg. Co. See p. 397.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 398.

Supplee Steam Engine. See adv. p. 397.

Punching Presses & Shears for Metal-workers, Power Drill Presses, all sizes. Power and Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

The Best constructed low priced Engines are built by E. E. Roberts, 107 Liberty St., New York. Communicate.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 396.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Peck's Patent Drop Press. See adv., page 398.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

4 to 40 H. P. Steam Engines. See adv. p. 382.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 382.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Learn Telegraphy. Outfit complete, $4.50. Catalogue free. J. H. Bunnell & Co, 112 Liberty St., N. Y.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C. Forsaith & Co., Manchester, N.H., and N.Y. city.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N.J.

For Machinists' Tools, see Whitcomb's adv., p. 366.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 413.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 413.

Peerless Colors for Mortar. French, Richards & Co., 4:0 Callowhill St., Philadelphia, Pa.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 413.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Engines, 10 to 50 H. P., $250 to $500. See adv., p. 413.

Pure Grain Nickel, Rolled and Cast Anodes, Nickel Salts. Greene, Tweed & Co., 118 Chambers St., New York.

Safety Boilers. See Harrison Boiler Works adv., p. 412.

The Medart Pat. Wrought Rim Pulley. See adv., p. 412.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 413.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 413.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 425, Pottsville, Pa. See p. 413.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 412.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phila. P.

The New Lace Cutter saves cost on each side. Leather cut. Sample by mail, 50 cts. Greene, Tweed & Co., N. Y.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 413. Totten & Co., Pittsburg.

Portable Power Drills. See Stow Shaft adv., p. 413.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) J. A. C. asks how he can temper and put an edge on a piece of sheet steel five inches long half an inch wide, and one-sixty-fourth of an inch in thickness. A. Steel in this form is best hardened in oil. It may be tempered by blazing off. It may be brought to an edge on a wet grindstone.

(2) A. B. N. asks how much of which kind, and what number of insulated copper wire, to use in making a sounder-magnet, 1½ inches long by ¼ inch core—to be one, and sometimes two instruments on a short line, probably from one room of the house to another. A. Use eight or ten layers of silk covered insulated copper wire, No. 22.

(3) J. E. K. asks: Can you inform me how to get rid of roaches? Our building is infested with them. We have tried a great many drugs, but with no effect. We are manufacturers of paper bags, and the paste breeds them. A. Use plenty of finely powdered borax and dalmatian insect powder. Put a small quantity of borax in the paste.

(4) J. S. B. writes: Please explain the manner in which the air brake operates in checking a railroad train. A. In the vacuum brake the exhaustion of the air from behind the piston allows the external air to drive the piston inward, carrying with it the brake levers, thus applying the brakes. In the air brake the air pressure created at the locomotive acts on a piston connected with the brake.

(5) M. M. H. wants to know how to make a good quality of court plaster. A. Soak isinglass in a little warm water for seventy-four hours, then evaporate nearly all the water by gentle heat, dissolve the residue in a little proof spirits of wine, and strain the whole through a piece of open linen. The strained mass should be a stiff jelly when cool. Now stretch a piece of silk or sarsanet on a wooden frame, and fix it tight with tacks or packthread. Melt the jelly, and apply it to the silk thinly and evenly, with a badger hair brush. A second coating must be applied when the first has dried. When both are dry, apply over the whole surface two or three coatings of balsam of Peru. Plaster thus made is said to be very pliable and never breaks.

(6) R. J. B. asks how white lead is made. A. The molten lead is poured through an iron sieve into a tank filled with water, whereby it is converted into threads of one-sixth of an inch in thickness, which are now placed in vats, each of which holds about 1,000 threads. Vinegar is now poured over the lead, and immediately drawn off again. Under the influence of the air and the vinegar adhering to the metal, the latter is oxidized. The vinegar is now poured into the vat and again drawn off, when it carries away the acetate formed on the surface of the metal in solution. After this process has been repeated a number of times, the vinegar has been transformed into a concentrated solution of basic acetate of lead, from which the carbonate may be prepared by the introduction of a current of heated carbonic acid gas. The supernatant liquid is mixed with another quantity of vinegar, used again for the same process.

(7) A. A. U. writes: I have or had a slip of selenite on a glass slide to show various colors with the polarizer. The glass slip got broken, and I carefully heated the slip and transferred it to another piece of glass. It looks just as it did before, but does not work. It looks no different from a piece of glass. A. It has probably been injured by the heat, an cannot be repaired.

(8) C. A. V. writes: Having been a reader of your paper for more than twenty years, and knowing that it is justly held in high favor by many others in this city, I know that an opinion expressed in your columns would have due weight and consideration with your subscribers here. Can you give us an article in relation to smoke consuming? Or, if not consistent with your practices to do that, will you give replies to the following questions in your Answers to Correspondents: Does a mixture of steam and air introduced into the fire box of a boiler furnace have an injurious effect on the boilers? If it does, in what way and to what extent. I have heard it stated that when steam is injected into a boiler furnace a chemical combination takes place between the steam and the coal, forming a gas or vapor which corrodes the adjacent iron. Is this the case, and if so, what is the action? What is your opinion in regard to using a steam jet, or a combined steam and air jet, for the purpose? A. When steam is brought into contact with highly heated pure coal in an engine fire box, carbonic oxide, carbonic acid, hydrogen, vapor of water, and nitrogen are the chief products. If air is injected above the fuel less carbonic oxide and hydrogen pass off unconsumed. Ordinary coal, however, nearly always contains more or less sulphur, and the sulphurous oxide formed in burning may be changed by contact with the steam to hydrosulphuric and sulphuric acids, both of which injure iron, especially when mixed with much aqueous vapor. The latter portions of a boiler are, however, not so apt to be corroded by these as the portions furthest from the fire. A steam jet in the fire box may, therefore, prove injurious to the boiler in some cases. Steam and air, or air alone, introduced at the proper time and in proper proportions, is effective.

(9) J. M. K. asks: Is it possible to freeze pure alcohol or pure whisky? A. Alcohol could doubtless be solidified, but it would require a temperature lower than any yet attained by artificial means.

(10) W. N. W. writes: Will you kindly tell me how to clean or whiten the white medallions on blue Wedgwood ware? A. As the colors are burnt in it is not possible to bleach or remove them, save by mechanical means, such as the sand blast or scratch brush.

(11) D. H. A. writes: 1. I wish to coat small castings with some material that would be permanent and resist the action of hot water. Is there any material as good as galvanized iron, that would be cheaper than said material? A. Zinc is probably the cheapest coating. 2. Please describe the process of galvanizing. A. Cleanse the castings by pickling them in water to which has been added about ten per cent of sulphuric acid, and scouring with sand. After rinsing pass them through a strong slightly acid aqueous solution of zinc chloride, and then put into a bath of melted zinc (contained in a shallow iron pot over a furnace) until properly coated with zinc. The bath of zinc should be covered with a layer of salammoniac to keep its surface free from zinc oxide. 3. Would there be any objection to having a churn made wholly of tin? A. Yes; wood is to be preferred.

(12) W. G. A. B. asks: Can you tell me how to make the moulds of glue and molasses, such as Rodgers uses for making his statuettes? A. The flexible moulds referred to are prepared as follows: Glue, 8 lb.; molasses (New Orleans), 7 lb. Soak the glue over night in a small quantity of cold water, then melt it by heat over a salt water bath, stir until froth begins to rise, then add and stir in briskly the molasses, previously heated. Continue to heat and stir the mixture for about half an hour; then pour.

(13) L. McN. asks: How can I obtain large crystals of boron? I obtained small crystals by heating together 80 grains of boracic acid and 100 grains of aluminum. Would keeping the crucible in the fire longer and cooling more slowly develop larger crystals? A. The largest crystals of boron are prepared as follows: 1,500 grains of anhydrous boracic acid are closely powdered and mixed with 900 grains of metallic sodium cut into small pieces. This mixture is introduced into a cast iron crucible previously heated to bright redness; 700 to 800 grains of solid, but previously fused sodium chloride is placed on the top of the mixture, and the crucible is covered. As soon as the reaction is over, the still liquid mass is thoroughly stirred with an iron rod and poured, while red hot, in a slender stream into a large and deep vessel containing water acidulated with hydrochloric acid. The undissolved pulverulent boron is then collected on a filter and washed with acidulated water until the boracic acid is got rid of, the washing being continued until the boron begins to run through the filter. It must be dried upon a porous slab without the application of heat. In order to convert this amorphous into crystalline boron it is mixed into a thick paste with water and packed tightly into a crucible with a piece of aluminum weighing about 90 grains in the center. The cover having been luted on the crucible is inclosed in a second one, the interval between the two being filled with recently ignited charcoal. The outer crucible is next closed with a luted cover and the whole exposed for about two hours to an intense white heat. The temperature is then allowed to fall slowly, and when cold the contents of the inner crucible are digested with dilute hydrochloric acid, which dissolves out the aluminum, leaving the boron in large clear yellowish or brownish octahedral crystals mixed with copper colored scales of boron and aluminum.

(14) J. D. H. asks: What is the action of alcoholic tinctures on blue litmus paper which it turns red? Pure alcohol has no effect on it. What is the cause of this? A. The tinctures (the extracts) you have been experimenting with are doubtless slightly acid.

(15) L. McN. writes: Can you give the proper proportion of ingredients to make a good clear glass? I have tried, upon recommendation 60 grains silica, 20 grains lime, and 28 grains clay, but instead of a glass I obtained a white stone. A. Fine hard glass is made from the following materials: Fine white sand (silica), 29 lb.; best calcined soda, 18 lb.; quicklime, 3½ lb.; niter, 1 lb., broken scrap glass (same quality), about 17 lb. A heap bottle glass is prepared from common sand, 100 lb.; soda (common), 30; wood ashes, 40; potter's clay, 100; broken glass, 100.

(16) J. J. B. writes: Please state manner of producing a white paste alive with animalcules just visible to naked eye. How long will it take to produce such? Several friends and myself were shown a paste similar to the above. A discussion arose as to the manner and time of its production. A. Mix wheat flour in to thin paste with a little yeast and cabbage water, and let it stand in a warm place until it becomes quite putrid. Mix this with water (or a little common vinegar) and examine. The time required to prepare such a paste under favorable conditions need not exceed three days.

(17) E. B. asks: Will you give me a recipe for making a bronze or varnish such as is used on steam radiators to give them a bright gold color? A. Give the iron a good coating of common gold size, reduced with oil of turpentine so as to work freely from the brush. When this coating has nearly dried lay on the bronze powder (procurable in the market) so that every part is covered. After standing for an hour or so go over the work with a soft cloth, removing all excess of the powder and developing the luster of the coating by gentle friction.

(18) H. B. L. asks: Will you please inform me how to finish wooden panels for oil paintings in the natural color of the woods and for black? A. You will find directions for such painting in "The Painter, Gilder, and Varnisher's Assistant." Address the book-dealers who advertise in this paper.

(19) W. R. S. writes: I have a separate sink in my yard into which the deposit of my water-closet empties. It was dug sixteen years ago, and has a light sandy bottom. For fourteen years no sign of its filling was apparent; suddenly it began filling, and in the past two years has had to be taken out three times. Had the kitchen refuse run into it, I could have easily accounted for the trouble in the grease forming a coating on the bottom preventing the fluid portion from filtering through the sand, but such is not the case. some persons have told me that there is a substance which, if emptied into the sink, will evaporate all the fluid and leave only the solid. Can you tell me what means will dispose of this fluid? A. This is a common difficulty, due chiefly to the gradual clogging up of the soil in the immediate vicinity. A new cesspool or connection with a sewer trap are the only remedies we know of.

(20) J. P. asks: 1. Will rubber (elastic) bands serve for making rubber cement? A. No; pure (unvulcanized) rubber is required. 2. About what is the per cent of chlorine gas contained in ordinary chloride of lime? A. It is very variable in the commercial substance it varies from 12 to 30 per cent. When pure, dry, freshly prepared bleaching powder may contain 38·5 per cent of the gas. 3. What quantity of commercial sulphuric acid is necessary to set free the chlorine gas in ordinary chloride of lime? A. As one sample may contain much more of the gas than another it is impossible to give close figures. The pure, dry, freshly saturated substance would require about 1¾ times its weight of the acid for its complete decomposition. 4. What is the proportion of glycerine to glue for printer's rollers? A. If the glycerine is concentrated use about equal parts of both.

(21) E. T. G. asks for the best and most practical method of bluing tire bolts and stove bolts. A. Run your bolts through an inclined iron cylinder revolving over a fire. The speed of the cylinder must be regulated with reference to its temperature.

(22) E. R. writes: If "W. F. E.," No. 31, of December 17, will paint his stove with paint made of powdered black lead and linseed oil, and polish in the ordinary way when dry, he will have a sample stove that may be left out in all kinds of weather without injury to the polish.

(23) R. V. J. writes: 1. I have a can nine inches high and six inches in diameter, made of heavy galvanized iron, with a brass faucet in, all joints soldered secure. I wish to exhaust about one-third of the air it contains by means of the air pump, but it fills again in a short time. Have had it resoldered several times, and a different faucet put in, but with the same effect. Can it be made air tight, and by what means? A. Yes; fill the vessel with water under pressure to discover the leaks, which mark and secure with solder, after relieving the pressure. A well packed faucet must be used. 2. Is there any coating that could be applied to canvas to make it air tight that would resist the pressure of the atmosphere? A. Give the cloth several coats of rather thick alcoholic shellac varnish, allowing each to dry before another is put on. 3. I have a box containing one hundred and twenty-five cubic feet made of wood with sufficient strength to frame work inside to stand the force of atmospheric pressure. What is the cheapest material it could be covered with that will exclude air? I wish to exhaust air from the box and retain it for a length of time at about five pounds pressure within. A. You could use the varnished cloth above described, sheet metal, or lead foil.

(24) R. C. Co. ask: What will remove claret stains from white linen goods without injuring the fabric? A. See directions under "How to Remove Stains," in SUPPLEMENT, No. 158.

(25) W. J. McD. asks: 1. What will make thick petroleum lubricating oil, that is dark colored, lighter colored, or nearly transparent, without spoiling it for lubricating? A. See "Lubricants," page 41, current volume. 2. How is the white paraffine obtained from the thick waxy substance that comes out of the wells, and what is the process? A. Paraffine in an impure state is separated from the oil by refrigerating or "freezing" the fluid, and cold pressing. It is purified

© 1881 SCIENTIFIC AMERICIAN, INC

by resolution in fresh oil and reprecipitated and separated by cold and pressure. 3. How can pure paraffine be made to melt at a higher degree of heat without otherwise destroying its properties? A. Its melting point cannot be elevated without altering its properties in some degree.

(26) F. W., Jr., writes: I see in some newspapers notices of "ozone" for preserving fruits, meats, etc. Can you give your opinion as to its value, method of preparing, applying, expense, and any other information you may be willing to suggest in regard to preserving fruits? A. We have no knowledge of any practical process for preserving fruit, etc., wherein ozone is employed. The liquid preserving agents called ozone preservatives, etc., are commonly solutions in water of the sulphites of lime and soda potassa or ammonia. Aside from the cost of producing ozone this substance, though a disinfectant, is not a preservative agent in any sense.

(27) F. G. asks: What can be used to prevent store show windows from sweating when the gas is being lit in the evening? I have taken the gas out and put in a ventilator, still they sweat and are of no use in the evening when we want to make the most show. A. Apply to the glass evenly a slight film of pure glycerine, and you will not be troubled by the "sweating" complained of. Glycerine used in this way will also prevent the formation of frost on the glass in cold weather.

(28) J. W. C. asks: What liquid or liquids will penetrate rubber? A. Try pure bisulphide of carbon or benzole. In these rubber (if pure) first swells and then dissolves. If 15 per cent of absolute alcohol is mixed with these liquids the rubber does not go into solution. Vulcanized rubber swells up without dissolving in these liquids.

(29) A. L. Y. asks: Please give a good receipt for a cologne. A. Alcohol 95 per cent, 1 quart; oil of cedrat, 9 drachms; oil of thyme, 2 drachms; oils of bergamot and lemon, 6 drachms; oil of Portugal, 4 drachms; oils of neroli, vervain, and rosemary, 2 drachms; oil of mint, 2½ drachms; eau de melisse, 2 drachms; tincture of musk, 24 drops. Mix, and after standing twenty-four hour filter till clear.

(30) J. N. asks: Will you please let me know in your Notes and Queries column how to make a dip for brass wire, to be used in bird cages? One that will prevent the wire from corroding or getting dirty. A. Seed lac, dragon's blood, annatto, and gamboge, of each, 4 oz; saffron, 1 oz.; wine spirit, ten pints. Triturate together and digest for several days, with occasional stirring. Then strain for use.

(31) Q. L. asks: Can caoutchouc which has been dissolved in carbon-bisulphide and then mixed with the right proportion of sulphur, be vulcanized to make *ebonite*? A. As we understand you, yes—the process is covered by several patents. 2. In vulcanizing rubber, is it necessary that steam heat be used, or will dry heat do as well? A. Dry heat will do, but steam can be used to better advantage.

(32) E. A. E. asks: How is water gas made; is it used for lighting, or only for heating; will it condense by conveying it in pipes under ground 1,000 feet; who are manufacturers of it? A. Water gas, so called, is made by passing dry steam through a column of highly heated coal contained in an air-tight furnace. A gas rich in hydrogen and carbonic oxide, mixed with carbonic acid, results. The latter impurity, together with others derived from the coal, are purified by washing in water and passing over quick-lime. For illuminating purposes it requires to be mixed with another gas—derived from petroleum—very rich in hydro-carbons. When properly prepared, very little of it condenses under ordinary conditions of temperature and pressure. See our advertising columns for addresses of those interested in this process.

(33) F. D. H. writes: A pulley 8 inches diameter is driven by belt from a pulley 36 inches diameter, making 230 revolutions. Against this belt presses a pulley 6 inches diameter. How many revolutions does the 6 inch pulley make, and what is the rule for finding the same? A. The speed of the belt is the same as that of the periphery of the driving wheel, and the relative speeds of the driving and driven wheel is as their diameters. E g., 6 : 36 :: 230 : 1380. The speed of the 6 inch pulley is 1380 revolutions per minute.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

M. C.—It is powdered slate or argillaceous rock containing iron sulphide—and possible traces of precious metals—an assay would be necessary to ascertain what value (if any) it has as an ore.

NEW BOOKS AND PUBLICATIONS.

THE ST. NICHOLAS MAGAZINE. NEW York: Published by the Century Co.

It is impossible to speak in too high terms of eulogy of *St. Nicholas*. It is confessedly unapproached and unapproachable in its peculiar field. It is a marvel of perfection, both as regards its literary excellence, its artistic merit, and its singular adaptability to the requirements of an eager and alert generation of young readers.

The volumes for 1880 81, now before us, maintain the high standard set for the guidance of those who have devoted their best talents to the production of *St. Nicholas*. The index contains the names of some of the foremost writers of the land, such as Rossiter Johnson, who has struck an entirely new vein in story writing for boys. William O. Stoddard, Felix L. Oswald, Frank Stockton's irresistibly funny fairy tales, Mrs. Dodge's "Jingles," and the clever sketches contributed by Emily Huntington Miller, Lucretia P. Hale, Susan Coolidge, and others, are enough to make the reputation of any magazine for young people It may be truly said that the boys and girls of the English-speaking race have now presented to them, in the annual volumes of *St. Nicholas*, the best work by the best writers for young people.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 29, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air blast, S. W. Hudson ... 250,073
Album clasp, E. S. Glover ... 250,066
Albumen, manufacturing, U. H. Hillman ... 250,071
Alloy, inoxidizable, P. De Villiers ... 250,326
Amalgamator, P. B. Wilson ... 250,318
Annunciator case, telephone, J. Fearey ... 250,140
Annunciator, electro-magnetic, J. Capron (r) ... 9,946
Auger, earth, W. J. Sherman ... 250,293
Ax handle attachment, W. S. Bugg ... 250,198
Axle box cover, D. A. Bolt ... 250,194
Axle, vehicle, H. Dugan ... 250,221
Bag holder, V. Wheat ... 250,315
Bales of fibrous material, reducing, P. K. Dederick ... 250,135
Ball. See Target ball.
Battery. See Galvanic battery.
Bed lounge lock, Ott & Madden ... 250,097
Bit stock, Q. S. Backus ... 250,047
Bit stock, L. J. Baker ... 250,186
Blotting case, F. R. Grumel ... 250,234
Blowing machine, J. F. Bender ... 250,124
Board. See Electrical switch board.
Boiler. See Hot water and steam boiler. Steam boiler.
Bolt threading dies, cutting, H. E. Coy ... 250,134
Book, scrap, B. J. Beck (r) ... 9,952
Boot and shoe attachment, W. W. Stewart ... 250,108
Boots and shoes, removable lining for, E. Waite ... 250,114
Boring holes in chair legs, machine for, F. F. Parker ... 250,167
Bottle stopper, S. S. Newton ... 250,163
Bottles and jars, handle attachment for glass, J. C. Morris ... 250,276
Bottles, etc., packing for, O. Long (r) ... 9,948
Box. See Cuff box. Egg box.
Brake. See Car brake.
Button, detachable, J. C. Blake ... 250,130
Button or stud, sleeve or collar, N. Nelson ... 250,277
Button, separable, H. Lawrence ... 250,082
Camera, W. M. De Voe ... 250,214
Can. See Refrigerator can.
Can filling machine, B. Sewall ... 250,172
Candle sheath, H. R. Harper ... 250,145
Cane mill, Field & Magee ... 250,141
Car brake, Kearney & Davis ... 250,258
Car, cattle, N. P. Wilkerson ... 250,120
Car pusher, J. Pennycook ... 250,168
Car, sleeping, J. M. Forbes ... 250,224
Car, stock, W. S. Hunter ... 250,251
Carriages, reversible handle for children's, J. Zimmermann (r) ... 9,955
Cart, breaking, J. V. Upington ... 250,303
Cart, manure dumping, E. Price ... 250,282
Case. See Annunciator case. Blotting case.
Caster, M. B. Schenck ... 250,290
Castings, core for forming screw threads on, G. Cowing ... 250,206
Chest. See Cracker chest.
Cigar lighter, electric, Mott & Stern ... 250,094
Clasp. See Album clasp.
Clevis for elevators, suspension, C. M. Mallory ... 250,090
Clothes drier, A. H. Stephens ... 250,295
Clutch for pulleys and hoisting engines, friction, H. E. Armitage ... 250,182
Coffee, aging and improving the quality of, C. S. Philips ... 250,100
Coffee, aging and maturing, C. S. Philips ... 250,099
Coffins into graves, device for lowering, W. Keisling ... 250,259
Cold, apparatus for producing, G. F. Meyer ... 250,158
Colors for ornamenting fabrics, preparing, W. H. R. Toye ... 250,302
Colors, manufacture of rosaniline, J. Holliday ... 250,247
Colter, rolling, D. W. Hughes ... 250,249
Comb, A. Taylor ... 250,298
Congelation of water, etc., facilitating the, O. Guthrie ... 250,235
Coop or crate, O. Collins ... 250,205
Cork fastener, bottle, J. Walker ... 250,310
Cornstalk cutter, A. Cherry ... 250,054
Cotton picker, W. Lee ... 250,267
Coupling. See Hose coupling.
Cracker chest, D. W. Mills ... 250,159
Crane, traveling, J. Walker ... 250,312
Crib, folding, Wilbur & Hungerford ... 250,119
Crimping iron cabinet, M. A. Kaler ... 250,256
Crucible furnace, G. Nimmo ... 250,095
Crushing and mixing granular and pulverulent material, machine for, P. H. Bracher ... 250,197
Cuff box, I. P. Turner ... 250,113
Cuff holder, E. A. Robbins ... 250,170
Cuff or collar fastening, M. Loomis ... 250,268
Cultivator, wheel, F. O. Williams ... 250,180
Curtain fixture, W. A. Bowyer ... 250,196
Curtain roller, spring, B. I. Hicks ... 250,244
Cutter. See Cornstalk cutter. Meat cutter. Plow cutter. Stalk cutter.
Dental plate, J. G. Yemen ... 250,320
Disintegrating mill, L. J. Bennett ... 250,195
Divided ring or link, H. T. Booraem ... 250,195
Door hanger, S. Ide ... 250,252
Drier. See Clothes drier. Fruit drier.
Drying rack, adjustable, J. R. Moore ... 250,160
Ear piercing instrument, F. X. Xavery ... 250,121
Egg box, J. L. Stevens ... 250,296
Egg tester, W. S. Sanderson ... 250,105
Electrical switch board, T. W. Lane ... 250,081
Electro-magnetic device, E. Thomson ... 250,175
Elevator buckets, double seamer for, F. H. C. Mey ... 250,093
Elevator buckets, forming the bodies of, F. H. C. Mey ... 250,157
Embroidering and sewing machine, E. Cornely ... 250,325
Enameled ware, etc., E. C. Quinby ... 250,102
End gate, wagon, H. H. Perkins ... 250,280
Engine. See Traction engine.
Fabric. See Textile fabric.
Fabrics, ornamenting, W. H. R. Toye ... 250,301
Faucet, F. C. Lillis ... 250,085
Fence, barbed, T. H. Dodge ... 250,219
Fence wire, barbed, P. P. Hill ... 250,070
Fence wire stretcher, J. F. Landers ... 250,264
File cutting machine, J. H. Schaal ... 250,171
Firearm, breech-loading, F. Beesley ... 250,189
Fishing reel, J. Palmer ... 250,165
Fishing rod, T. H. Chubb ... 250,204
Forging rear forks of bicycles, die for, H. T. Russell ... 250,289
Fruit drier, A. W. Walker ... 250,309
Fruit press, D. H. Whittemore ... 250,317
Fuel, artificial, Walker & Brott ... 250,115
Furnace. See Crucible furnace. Glasshouse furnace.
Furnace for burning solid fuel, C. Gearing ... 250,064
Furniture polisher, J. Swensson ... 250,297
Furs and articles thereof, making skinless, Koch, Jr., & Burgmüller ... 250,262
Galvanic battery, L. D. McIntosh ... 250,155
Gas lighter, electric, W. R. Nutting ... 250,279
Gate. See End gate.
Glasshouse furnace, J. J. Gill (r) ... 9,950
Glove for husking corn, W. E. Hall ... 250,068
Glucose, manufacture of, Weber & Scovell ... 250,117
Gold saving apparatus, N. H. Falk ... 250,223
Grain binder, J. F. Gordon ... 250,231
Grain meter, R. Forward ... 250,226
Grinding mill, J. Higginbottom ... 250,245
Handle. See Saw handle. Umbrella, parasol, or cane handle.
Hanger. See Door hanger. Shaft hanger.
Harrow, T. Haxton ... 250,242
Harrow, spring tooth, G. L. Gilkey ... 250,065
Harvester, J. P. Manny ... 250,270 to 250,272
Hats, machine for beating napped, G. Yule ... 250,321
Hay gatherer or loader, E. Bamberger ... 250,123
Headlight, locomotive, J. M. Kelly ... 250,260
Heating water over lamps or gas, device for, C. S. Tallmadge ... 250,111
Holder. See Bag holder. Cuff holder. Rein holder. Spool holder.
Hook. See Snap hook.
Horse detacher, R. W. Clendening ... 250,057
Horseshoe weight attachment, J. Harney ... 250,240
Hose coupling, L. Ford ... 250,225
Hot water and steam boiler, Livingstone & Wright ... 250,087
Illuminating apparatus, C. M. Lungren ... 250,089
Indicator. See Station indicator.
Inkstand, C. De Roberts ... 250,213
Jack. See Lifting jack.
Knife, fork, and spoon, combined, F. Praunegger. 250,281
Knitting machine cam lock, A. B. Dodge ... 250,218
Lamp, G. Bohner ... 250,049
Lamp, electric, L. K. Böhm ... 250,192, 250,193
Lamp, electric, E. M. Fox ... 250,227
Lamp, electric, J. H. Irwin ... 250,149
Latch, gate, F. N. Martin ... 250,091
Level, spirit, G. Egart ... 250,061
Level, spirit, F. Kraengel ... 250,080
Lifter. See Stove, etc., lifter.
Lifting and weighing device, A. Arnot ... 250,183
Lifting jack, J. C. Beard ... 250,188
Light. See Headlight.
Lock. See Bed lounge lock. Knitting machine cam lock.
Lumber trimming machine, W. B. Swartwout ... 250,174
Maize, treating, L. Chiozza (r) ... 9,947
Meat cutter, G. P. Treulieb (r) ... 9,954
Mechanical movement, J. M. Griest ... 250,233
Mechanical movement, Porter & White ... 250,169
Medical compound, W. H. Eaves ... 250,222
Meter. See Grain meter.
Milk and cream, apparatus for preserving, F. M. Slutz ... 250,294
Mill. See Cane mill. Disintegrating mill. Grinding mill.
Mirror, E. G. Gollner ... 250,229
Mirorrs, device for suspending, A. Iske ... 250,074
Moulding machine, gear, J. Walker ... 250,311
Mortar for laying bricks, etc., Arrouquier & Barrett ... 250,122
Mortising machine, chair leg and arm, F. F. Parker 250,166
Motor. See Pump motor. Sewing machine motor.
Motor, I. L. Landis ... 250,265
Nippers, police, J. B. Craig ... 250,208
Nut and bolt lock, W. C. Kownover ... 250,079
Nut making machine, W. E. Ward ... 250,116
Ore concentrator, S. Kendall ... 250,261
Ore concentrator, centrifugal, A. D. Clarke ... 250,056
Ore separator and pulverizer, A. McKellar ... 250,156
Oven illuminator A. Gampe ... 250,142
Pail, chamber, F. Heyl ... 250,243
Pantaloons and overalls, L. S. Bortree ... 250,131
Parasol lining and the method of applying the same, L. L. Gans ... 250,063
Parer, corer, and slicer, apple, B. D. Tabor ... 250,110
Picker. See Cotton picker.
Plow, J. Lane ... 250,151
Plow cutter, M. W. Farber ... 250,139
Plow, listing, J. Lane ... 250,152
Plow, planting, J. Lane ... 250,153
Plow sulky planting, Black & Pates ... 250,048
Pocket for reversible garments, M. Goldberger ... 250,228
Power machine, manual, F. Rourk (r) ... 9,953
Preservation, hermetically sealed receptacle for food, W. W. Stewart ... 250,109
Press. See Fruit press.
Printer's lead and slug rack, C. De Vos ... 250,215
Printing films, adjustable frame for, B. Day ... 250,211
Printing machine, J. E. Hinds ... 250,246
Printing machine registering device, T. M. Vieillemard ... 250,304
Printing plate, C. H. Hansen ... 250,238
Printing plates, preparing matrices for producing, C. H. Hansen ... 250,239
Pulverizer, dirt, J. H. Burd ... 250,199
Pump, W. F. Johnston ... 250,253
Pump, M. Walker ... 250,178
Pump, double-acting, H. Santrock ... 250,106
Pump motor, O. M. Tomlinson ... 250,300
Pump regulator, steam, H. Kessler ... 250,076
Rack. See Drying rack.
Railway, elevated, S. Dodson ... 250,220
Railway trains, signaling, etc., apparatus for electrically stopping, W. C. Shaffer ... 250,173
Reel. See Fishing reel.
Refrigerating preserving package, O. P. Johnson. 250,150
Refrigerator, A. W. Zimmerman ... 250,322
Refrigerator can or barrel, C. A. Sheridan ... 250,107
Regulator. See Pump regulator.
Rein holder, elastic check, L. M. Devore ... 250,058
Ring. See Divided ring.
Rod. See Fishing rod.
Roller. See Curtain roller.
Rosaniline, sulphonated compound of, H. Caro ... 250,201
Safe, fireproof, T. Brett ... 250,051
Saw blades by sand blast, apparatus for polishing, E. C. Atkins ... 250,185
Saw guide, band, H. A. Kimball ... 250,078
Saw handle, A. J. Doane ... 250,217
Saw tempering apparatus, E. C. Atkins ... 250,184
Sawing machine, D. Berry ... 250,191
Sawing machine, drag, G. B. Durkee ... 250,136
Seams of sheet metal cans, machine for making the, F. M. Leavitt ... 250,266
Separator. See Ore separator.
Sewing machine, T. Carey ... 250,053
Sewing machine corder, E. D. Fellows ... 250,062
Sewing machine embroidery attachment, R. M. Rose ... 250,288
Sewing machine motor, R. Whitehill, Jr. (r) ... 9,949
Shaft hanger and box, A. Loehner ... 250,088
Sheet metal, machine for squaring, E. Jordan ... 250,254
Sheet metal pipes, machine for threading, W. W. Crane ... 250,209
Sheet metal, press for working, E. Jordan ... 250,255
Skate, H. Dobson ... 250,059
Skate, roller, H. M. Yates ... 250,319
Sleigh, T. F. Westervelt ... 250,314
Snap hook, W. S. Truitt ... 250,112
Snow, heating apparatus for melting, C. Delafield. 250,212
Snow plow, W. W. Osborne ... 250,164
Soldering machine, can, H. R. Robbins ... 250,285
Soldering side seams of cans, machine for, E. Norton ... 250,096
Sower and fertilizer distributer, seed, H. P. Tenant ... 250,299
Spark arrester, C. H. Waters ... 250,313
Spike, J. B. Barnes ... 250,187
Spinning and reeling silk, machine for, J. E. Tynan ... 250,177
Spool holder, I. Dimock ... 250,216
Spring. See Vehicle spring. Watch case spring.
Stalk cutter, W. S. Boliver ... 250,050
Stand. See Telephone stand.
Starch, machine for reducing, R. W. Graves ... 250,143
Station indicator, Hackney & Hudson ... 250,236
Steam boiler, S. L. Hill ... 250,146
Steam condensing apparatus, J. Charlesworth ... 250,203
Steam engine reversing gear, A. J. Hoag (r) ... 9,951
Steering apparatus, steam, G. H. Reynolds ... 250,103
Stereotype locking device, E. P. Brown ... 250,052
Stocking, elastic, D. D. M. Master ... 250,154
Stockings, manufacture of, L. S. Cox ... 250,207
Stopper. See Bottle stopper.
Storage tank for petroleum, F. H. Benton ... 250,190
Stove base, J. K. McLaughlin ... 250,274
Stove cover, M. G. Carleton ... 250,200
Stove, heating, J. R. Graves ... 250,067
Stove, hot blast, F. W. Gordon ... 250,230
Stove, etc., lifter, T. S. Lindsay ... 250,086
Stove, oil, A. Krause ... 250,263
Stove or range, cooking, L. L. Culver ... 250,210
Stove polish, F. A. Page ... 250,098
Sugar and sirup, manufacturing, Weber & Scovell 250,118
Sugar, process of and apparatus for mixing glucose with cane, S. M. Lillie ... 250,084
Swimming apparatus, W. K. Kidder ... 253,077
Switch and signal apparatus, C. H. Jackson ... 250,075
Tablet, blotter, R. B. Holmes ... 250,327
Tanning hides, W. Harris ... 250,241
Target ball, J. Powell ... 250,101
Telegraph, automatic, R. K. Boyle ... 250,132
Telegraph, chemical, G. A. Hines ... 250,147
Telegraph instrument, W. A. Shaw ... 250,292
Telegraphic relay, O. Lugo ... 250,269
Telegraphic transmitter, S. V. Essick ... 250,138
Telephone receiver, H. E. Waite ... 250,305, 250,306
Telephone, speaking, F. Blake ... 250,126 to 250,129
Telephone stand, J. A. Seely ... 250,291
Telephone transmitter, H. Hunnings ... 250,250
Telephone transmitter, H. E. Waite ... 250,307, 250,308
Telephonic relay and repeater, C. A. Randall ... 250,283
Textile fabric from bamboo, cane, etc., Robbins & Southmayd ... 250,286
Thrasher and separator, combined, H. Hardgrove 250,069
Thrashing and separating machine, grain, Huber & Strobel ... 250,248
Thrashing machine, J. I. Case *et al.* ... 250,133
Tie for supporting header joists, B. F. Ellis ... 250,137
Tire upsetter, F. K. Collier ... 250,324
Torpedo boats, gas expansion chamber for, G. E. Haight ... 250,144
Torpedo flow controller for oil wells, V. Gretter ... 250,232
Torpedoes, apparatus for placing railway, W. M. & W. A. White ... 250,179
Toy, automatic, J. Doyle ... 250,060
Traction engine, R. B. Chritton ... 250,055
Truss, J. B. Mayer ... 250,092
Truss, hernial, W. Nelson ... 250,278
Tuyere, forge, A. W. Morgan ... 250,161
Umbrella, parasol, or cane handle, G. W. Hughes. 250,328
Valve gear, steam engine, L. Ransom ... 250,284
Valve, slide, W. B. Turman ... 250,176
Vehicle spring, G. B. Hamlin ... 250,237
Vehicle, two-wheeled, S. W. Metcalf ... 250,275
Velocipede, W. A. Whiting ... 250,316
Verges and pendulum rods, device for making, A. E. Hotchkiss ... 250,072
Washing machine pounder, J. D. Carr ... 250,202
Watch case spring and holder, R. F. Burke ... 250,323
Watch, stem winding, J. W. Hurd ... 250,148
Watches, method of and apparatus for demagnetizing, H. S. Maxim ... 250,273
Wave power, machine for utilizing, I. L. Roberts. 250,104
Whip, Mullen & Noble, Jr ... 250,162
Whistle, call, C. S. Leet ... 250,082
Wire finishing apparatus, H. Roberts ... 250,287
Wood ornaments, composition for artificial, O. O. Karsch ... 250,257
Wood working machine, R. H. Andrews ... 250,181

DESIGNS.

Carpet, T. J. Stearns ... 12,587
Oil cloth, C. T. & V. E. Meyer ... 12,584 to 12,586
Saucepan handle, L. & W. H. Berger ... 12,582
Window cleaner handle, E. P. Hall ... 12,583

TRADE MARKS.

Cigars, H. Feltman ... 8,882
Cotton piece goods, Naumkeag Steam Cotton Company ... 8,886, 8,887
Cracker or biscuit, soda, E. J. Larrabee & Co ... 8,884
Dentifrice, E. Steinhauser ... 8,889
Fish and salt mackerel, cod, J. Pew & Son ... 8,888
Gin, Adams, Taylor & Co ... 8,877 to 8,879
House furnishing japanned toilet ware, Hollander & Bradshaw ... 8,894
Lead white, Vogeler, Son & Co ... 8,890
Liniment, H. D. Kendall ... 8,883
Medicine, cough, C. A. Lewis ... 8,885
Oranges, Wessels & Co ... 8,891
Perfumes, H. S. Evans ... 8,881
Pharmaceutical preparations, certain, J. Wyeth & Brother ... 8,893
Saws, crosscut, E. C. Atkins ... 8,880
Vermifuge, W. G. White ... 8,892

© 1881 SCIENTIFIC AMERICIAN, INC

A CATALOGUE OF SOME OF THE VALUABLE PAPERS CONTAINED IN THE SCIENTIFIC AMERICAN SUPPLEMENT.

These paper may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

ENGINEERING.

Civil Engineering.

THE UNITED STATES NEW IRON Landing Pier: Del. Breakwater Harbor; built on iron screw piles. Designed by Lieut. Colonel J. D. Kurtz, U. S. Corps of Engineers. A full history, with map, description, details, and scale drawings. By A. Stierle, C.E., assistant engineer of the works. A valuable and important paper. With 42 illustrations. SUPPLEMENTS **72** and **73.** Price 10 cents each.

AN AQUEDUCT OF SMALL LEAD PIPE. —By Professor R. Fletcher. A brief history and description of a line of lead pipe, one and a half inches in diameter, which has been in successful operation for more than half a century in Hanover, N. H., requiring no expensive reservoir, no excessive outlay for maintenance, and which has paid good dividends on the investment. A paper worthy the attention of inhabitants of villages who desire to provide themselves with a systematic water supply at small cost. Contained in SUPPLEMENT **266.** Price 10 cents.

TUBE WELLS FOR LARGE WATER Supplies. By Robert Sutcliff. Read before the Society of Engineers, London. Favorable and Unfavorable Soils, Gravel, Chalk, Marls, Sand, Rocks, and Stones, and How to Deal with each. How Messrs. Allsopp & Sons obtain 60,000 gallons of water per hour from Tube Wells. Messrs. Bass & Co.; the Solway Hematite Iron Works; Messrs. Truman, Hanbury & Buxton's Brewery; Messrs. Warwick's Brewery; the Tunnel Portland Cement Co., all of England, and their water supply. Mode of Sinking. How to obtain Water from Fine Sand. Five figures. SUPPLEMENT **110.** Price 10 cents.

THE DRIVE WELL IN ENGLAND.—A Paper read before the Society of Eng., Lond., by Mr. Le Grand. Full Description of the Operations of Driving, and how all Contingencies are Met. The several Methods of Working. Details of all parts of the Apparatus and their Use, with fourteen figures. Purity and Cheapness of the Water Supply from Drive Wells; Usefulness of the Well in War. The Tube Well for Testing Land for Water or Foundations, and for Driving Iron Piles under Water. SUPPLEMENT **107.** Price 10 cents.

RAYNOR'S PLANS FOR IRON SUBmarine Railway Tunnels. By George Raynor, C.E. With description and ten illustrations. SUPPLEMENT **24.** Price 10 cents.

STREET PAVEMENTS AND SIDEWalks.—A description of the best kinds at present in use in various large cities of the United States, with the cost per square yard. By F. Shanly, C.E., City Engineer of Toronto. SUPPLEMENT **33.** Price 10 cents.

SUBMARINE FOUNDATIONS, BEING A Description, with dimensions and scale drawings of the apparatus employed at Polar Harbor, Austria. SUPPLEMENT **30.** Price 10 cents.

LOUISVILLE RAILWAY BRIDGE OF the Cincinnati Southern R. R., over the Ohio river. 2 pages of engravings. SUPPLEMENT **55** Price 10 cents.

DREDGING AND DITCHING MACHINery.—The latest and most successful machinery now in practical operation at Lake Fucino. With scale drawings and details, showing construction, operation, and economy. By M. A. Briesse, M.E. A most excellent and valuable paper upon the subject. SUPPLEMENT **8.** Price 10 cents.

THE BOTTROP CUT OF THE DUISBURG and Quackenbruck Section of the Rhenish Railway.—Description of a new and advantageous method of excavating adopted by the engineers of this railway in making a cut 1½ miles long and 71 feet deep in places, through a ridge of green marl, clay, and gravel; with eight engravings showing longitudinal and cross sectional elevations of the cut and progress of the work, and details of construction of frame of exploring tunnel and dumping trestle. Contained in SUPPLEMENT **276.** Price 10 cents.

REMOVAL OF SAND BARS.—EXPERIments made at Boulogne-sur-Mer, France, on a New System for Removing Sand Bars at the Mouths of Rivers. By M. Ch. Bergeron. Read before the British Association. Valuable experience and deductions therefrom, with description and 10 illustrations of apparatus employed. SUPPLEMENT **98.** Price 10 cents.

RAILWAY APPLIANCES AT THE Philadelphia Exhibition. A paper read before the Institution of Civil Engineers, London. By Douglass Galton, F.R.S. Showing the charact ristic differences between American and European Railways, etc. Both of the above papers are contained in SUPPLEMENT **125.** Price 10 cents.

HOW TO MAKE A DYNAMO-ELECTRIC Machine.—By George M. Hopkins. Practical instructions, with complete scale drawings. This machine may be run by hand or power. It is easily made; designed for experimental purposes; will heat from 4 to 6 inches of platinum wire; produce the electric light; decompose water rapidly; magnetize steel; ring a large gong; give powerful shocks; operate induction coils; and will, for temporary use, take the place of 8 or 10 Bunsen cells. SUPPLEMENT **161.** Price 10 cents.

IMPROVEMENTS OF PRAIRIE ROADS and Streets.—By T. J. Nicholl, C.E. Economical and Practical Suggestions, with six figures; on Width, Drainage, Ditching, Rolling Soils, Culverts, and Cost. How to Keep in Repair. Laying out the Streets of a Town, with Cost, and Repairs needed, etc. Contained in SUPPLEMENT **151.** Price 10 cents.

IRON RAILWAY TIES AND SLEEPERS. By Charles Wood, C.E. 12 illustrations. The various Systems of Iron Sleepers; the Bowl, Pot, or Oval; the Longitudinal Wrought Iron; the Transverse Wrought Iron. Practical experience with each. Durability of Wrought Iron for Sleepers. Adjustment of Gauge or Curves. Spreading Out. The Barlow Combined Sleeper and Rail. Hilf's, Hoenegger's, and Thomnen's Systems. Serre's and Battig's Systems. McLellan's and Potel's Sleepers. Wood's Cross System. The several systems illustrated, with particulars of Ballasting, Spikes, Keys, Collars, Chairs, and Tools; Labor, First Cost, Repairs, Wear, Corrosion, etc. SUPPLEMENT **125.** Price 10 cents.

THE EGYPTIAN OBELISK IN AMERICA —Full details concerning the removal of the Obelisk from Alexandria to New York, accompanied with a history of this and other similar Egyptian Monoliths. Illustrated with seven engravings showing: The Obelisk as it stood in Alexandria prior to removal; The Obelisk as it now stands in Central Park; The Obelisk as Mounted on Trunnions for Swinging: Landing the Obelisk at the Dock in New York; Rolling of the Obelisk from the Hudson River to Central Park; View of the Great Temple and Obelisk now standing at Luxor. Contained in SUPPLEMENT **267.** Price 10 cents. Another comprehensive article on this subject is contained in SUPPLEMENT **223,** showing the purposes for which obelisks were designed, their sizes and proportions, how quarried, how erected, where placed, and giving a history of Cleopatra's Needle, and a description of the methods employed in lowering it and shipping it to New York. Illustrated with three engravings. Price 10 cents.

ST. GOTHARD TUNNEL.—FULL HIStory of this wonderful feat of engineering, from its inception to its completion; with particulars as to dimensions; methods of excavation and total cost; and an account of the ceremonies which took place at completion. Illustrated with five engravings, showing the first passage of the engineer through the opening; the northern entrance to the tunnel; the meeting of the workmen after the completion; the first train through; and Prof. Colladon's air compressors. Contained in SUPPLEMENT **226.** Price 10 cents.

WIRE-ROPE STREET RAILWAYS OF San Francisco, Cal.—By A. S. Hallidie, M.E. Description, by the inventor, of a system of street railway now in successful operation in San Francisco, and which is specially adapted for use in cases where steam locomotives are not permitted, or where the streets are so steep as to make the use of horses difficult or impossible. With thirteen illustrations, showing passenger car and dummy, with gripping attachment and side section of tube; view of cars and track; section through dummy and roadbed; various views of grip; sections of tubes, pulleys, grips, etc. Contained in SUPPLEMENT **298.** Price 10 cents.

WIRE RAILWAY IN USE AT HAREwood Coal Mine, British Col. A Successful and Economical Construction; Grading avoided; 120 tons of coal per day carried 3 miles with 20 horse power Engine. One illustration. SUPPLEMENT **65.** Price 10 cents.

THE NEW POINT SUSPENSION Bridge at Pittsburg, Pa.—By the Am. Bridge Co. With description and 8 figures. SUPPLEMENT **34.** Price 10 cents.

NEW BRIDGE OVER THE DOURO — Brief descriptions, accompanied by illustrations of the various designs that have been submitted for the proposed one-span bridge over the river Douro. The work is one of considerable magnitude, and presents peculiar features in its general design and mode of erection which will prove of interest to all engineers. Illustrated with ten engravings. Contained in SUPPLEMENT **267.** Price 10 cents.

HYDRAULICS.— WATER AS APPLIED to Commercial Industries and Domestic Purposes within the United States.—Compiled by G. S. Morison, E. P. North, and J. Bogart, of the American Society of Civil Engineers. A valuable paper containing information upon American Canals and Water Powers. American Water Wheels. Hydraulic Engineering in California. Water Supply of American Cities. The Sandusky Stand-pipe. American Pumping Engines. Description of Pumping Engine at Lawrence, Mass., designed by E. D. Leavitt, Jr., C. E. Description of Worthington's Duplex Pumping Engines, designed by Henry R. Worthington, M.E. General Description of the Holyoke Dam and Canal, at South Hadley Falls. Description of the Dam across the Mohawk River at Cohoes, N. Y., designed by W. E. Worthen, C.E. Contained in SUPPLEMENT **193.** Price 10 cents.

THE CANAL SYSTEM OF NEW YORK. —A concise study of the present state and the possible future of New York Canals, with historical notices of the engineers of the past and their works. Canal projectors. Engineering. Original Engineer Corps. Construction and maintenance. Water supply. Defects and remedies. Steam propulsion. Business. Transportation cost. Buffalo charges. Proposed improvements. Contained in SUPPLEMENTS **291** and **292.** Price 10 cents each.

INTEROCEANIC CANAL PROJECTS.— By A. G. Mencoal, C.E. A very comprehensive review of all the routes which have been proposed for the interoceanic canal; Lieut. Vyse's Plan; Canals with Locks from Colon to Panama; the San Blas Route; the Nicaragua Route; Statistics and estimated Costs of the various plans, and conclusions. Contained in SUPPLEMENT **212.** Price 10 cents.

TOUGHENED GLASS SLEEPERS.—BY C. Wood, C.E. A paper read before the Iron and Steel Institute of Liverpool, in regard to the recent novel application of toughened glass to sleepers and chairs for railways and tramways; describing the method of toughening and moulding the material for such purposes, and giving the results of tests applied to the glass sleepers to ascertain their transverse resistance. Illustrated with seven engravings. Contained in SUPPLEMENT **204.** Price 10 cents.

THE PLATTSMOUTH BRIDGE.—FULL description of the new and important railway bridge constructed over the Missouri River at Plattsmouth, Neb., from plans by Chief Engineer George S. Morison. Locomotion. General description. Foundations. Masonry. The superstructure. Viaducts. Deck spans. Channel spans. Steel. Floor. Illustrated with eight figures, showing: perspective view of bridge; vertical sections; caissons; piers; and map showing location of bridge. Contained in SUPPLEMENT **285.** Price 10 cents. Another article (illustrated) on the same subject may be found in SUPPLEMENT **271.** Price 10 cents.

MOVABLE DAM WITH SWINGING Wickets and Trestles.—General description of a new system of movable dam as constructed at La Mulatiere, Lyons, France—an improvement on and modification of the Chaudine plan, peculiarly adapted for use on many of our American rivers. With nine engravings, showing transverse section, general plan and upstream elevation of the dam; mode of lowering and raising the uprights; method of maneuvering the wickets; maneuver of the trestles; plans of the new double-step hurter; view of a portion of the navigable pass of the dam recently finished at La Mulatiere, on the river Saone. Contained in SUPPLEMENT **264.** Price 10 cents.

PLATTSMOUTH BRIDGE OVER THE Missouri.—Details of construction of new Bridge now in process of building across the Missouri River, below the city of Plattsmouth, Nebraska. Length of Bridge, 3,000 feet; east approach, two miles long; west approach, one mile; permanent bridge of two through spans, 400 feet each; three deck spans, 200 feet each, and 1,560 foot iron viaduct. Contained in SUPPLEMENT **239.** Price 10 cents.

CHAUDIERE BRIDGE, OTTAWA.—DEscription of a seven-span railway bridge recently constructed over the Ottawa River, Canada, forming, from the dangers of the undertaking, one of the boldest conceptions that has as yet been carried out on any railway in existence. Total waterway, 2,050 feet; total length of iron superstructure, 2,154 feet; total length of bridge from shore abutments, 3,400 feet; cost, $310,000. With three illustrations, giving perspective view of bridge, map of locality, and vertical section of river bed and shores. Contained in SUPPLEMENT **283.** Price 10 cents.

WATER SUPPLY FOR TOWNS AND Villages.—By Clarence Delafield, C.E. A valuable report, showing the cost and merits of the various systems—Discussion of the Holly system, its merits and defects—The reservoir system, with pumps, cost and advantages—Results obtained and economy of use of various systems in different towns, with names and duty realized—Facts and figures to enable town committees to judge for themselves as to the system best suited for their wants—The best sources of water supply—Water-bearing rocks—Artesian wells, their feasibility, excellence, and cost of boring—Importance of pure water—How surface water is rendered impure—Cost of water pipes, from 2 to 12 inches diameter, for towns, including laying, all labor, materials, gates, joints, etc. Estimates of income, water-rates for supply of 1,000 buildings. Contained in SUPPLEMENT **27.** Price 10 cents.

THE GREAT TUNNEL UNDER THE Hudson River.—A Detailed Account of the Great Work now in Progress of Tunneling the Hudson River between New York City and Jersey City; accompanied by ten engravings exhibiting profile of the river bed, the plan of the entire work to be accomplished, the present progress of the work, the apparatus used, etc. Contained in SUPPLEMENT **227.** Price 10 cents. The same number contains a full account of the building of the great Thames Tunnel.

HYDRAULIC MACHINERY APPLIED to operating the Lock Gates of the Des Moines Rapids Canal.—A paper by R. Ralston Jones, giving a general account of the Canal, and a detailed description of the locks and gates and the machinery devised for operating them. Illustrated with ten figures, showing plan and sections of canal lock chamber; pumping engine and distributing valve; engine house; and plan, section, and elevation of hydraulic machinery at upper recess. Contained in SUPPLEMENT **280.** Price 10 cents.

PRELIMINARY REPORT UPON THE Improvement of the Navigation of the Missouri River.—By Major Charles R. Suter. A very valuable study of the geological structure and physical conformation of the Missouri River Valley, and of the characteristics of the River; with an account of the contemplated improvement of the latter—a subject of the greatest general importance. Contained in SUPPLEMENT **280.** Price 10 cents.

THE GREAT JETTY WORKS AT THE Mouth of the Mississippi River. A history of the work, with precise details of the construction, dimensions, method, etc. By E. D. Cortell, C.E., Chief Assistant Engineer of the Works. With 11 illustrations, including large chart of the South Pass and the Lines of the Jetties. SUPPLEMENT **21.** Price 10 cents.

THE BALTIMORE WATERWORKS.— Particulars of a Tunnel Seven Miles Long Through Solid Rock. The New Stone Dam. The Old Water Supply and the New, with Three Profiles of the Aqueduct. SUPPLEMENT **135.** Price 10 cents.

THE VICTORIA BRIDGE (IRON), BRISbane, Queensland.—By Robinson and l'Anson. With description and 14 illustrations. SUPPLEMENT **10.** Price 10 cents.

THE KENTUCKY RIVER BRIDGE.— Specifications, dimensions, with 8 illus. Also illustrated descriptions of the TAY BRIDGE, the POUGHKEEPSIE BRIDGE, the Lauria Floating Dock, and other Engineering Works. SUPPLEMENTS **66** and **95.** Price 10 cents each.

CASTING METALS, MEDALLIONS, Vases, and other articles in fusible alloys.—Full directions for home and shop practice, with engravings. By George M. Hopkins. SUPPLEMENT **17.** Price 10 cents.

CARLISLE BRIDGE, DUBLIN; AND Foot Bridge over River Nesa, at Inverness; both illustrated. Also WROUGHT IRON BRIDGE DESIGNS of improved construction. 2 illustrations. SUPPLEMENT **80.** Price 10 cents.

CONCRETE DOCKS OF NEW YORK.— With two engravings, showing the foundations of the docks, and the method of making the concrete blocks. SUPPLEMENT **23.** Price 10 cents.

BLOSSOM ROCK, HARBOR OF SAN Francisco. Account of its removal, method, and cost. By Colonel R. S. Williamson. With 25 illustrations, diagrams, etc. Presenting valuable information for engineers. SUPPLEMENT **24.** Price 10 cents.

THE NEW RAILWAY UP MT. VESUvius.—Description of the recently constructed railway for the ascent of Mount Vesuvius, up the immense grade of sixty-three feet in one hundred. Details of construction of road-bed, machinery, and rolling-stock, accompanied by six engravings, giving a general view of the railway, mountain, and crater; plan of road; side and end view of passenger car: map showing the physical conformation of the mountain, and carriage road and railway. Contained in SUPPLEMENT **235.** Price 10 cents.

AMERICAN IRON BRIDGES.—A VALUable paper on iron bridge building. By T. C. Clarke, C.E. SUPPLEMENT **32.** Price 10 cents.

ELEVATED CABLE RAILWAYS.—DEscription and illustration of an elevated cable railway, affording an easy and economical method of transporting coal, coke, ores, etc., to any distance regardless of the nature of the surface of the country. Contained in SUPPLEMENTS **270** and **274.** Price 10 cents each.

DESIGN FOR THE FIRTH OF FORTH BRIDGE.—I. General Description of the New Bridge, embracing calculations of forces and strains, weight, wind-structure, and stability against overturning. II. Complete Description of Details. III. Process of Erection. IV. General Remarks. The object of this valuable engineering article is to compare the merits of an arch bridge with those of a suspension for a given locality, and to show that the advantages are, without exception, on the side of the former. Illustrated with nine figures. Contained in SUPPLEMENT **229.** Price 10 cents.

AMERICAN BRIDGE ENGINEERING.— Compiled by G. S. Morrison, E. P. North, and J. Bogart, of the American Society of Civil Engineers. Containing particulars of the Illinois and St. Louis Bridge, designed by James B. Eads; the arrangement of the arches: form and dimensions of the spans; weight of iron in the structure; dimensions, and total cost. The Girard Avenue Bridge, Philadelphia, designed by Clarke, Reeves & Co.; description of trusses; the dead-load of the structure; the limit of strain on the parts; the kind of iron used; the floors, sidewalls, and roadways. Bridge at Port Jervis, New York, G. S. Morrison, Engineer, general description. Iron Railroad Bridge over the Ohio River, at Louisville, Kentucky, Albert Fink, Engineer: its length, and general description of the spans, with a statement of the quantity of iron in some of the principal spans. Rock Island Draw Bridge, designed and built by C. Shaler Smith, C. E., length and weight of the pivot span; description of the turn-table; how the span is rotated. Kentucky River Bridge, Cincinnati Southern Railroad, designed and built by C. Shaler Smith, C. E.; the peculiarities of its truss; the length of the girders; the piers and their pedestals. Bridge over Pennsylvania Railroad, at Forty-first Street, Philadelphia, Wilson Bros. & Co., Engineers; system employed in construction; general description; principal dimensions. Cincinnati Southern Railroad Bridge over the Ohio River at Cincinnati, built by Keystone Bridge Co.; dimensions; entire cost; description of trusses, floor, girders, etc. Point Bridge, Pittsburg, Penn.; designed by Edward Hemberle, Engineer, general description; total length, and height above water. Short description of the Iron Derricks used by the Passaic Rolling Mill Company, of Paterson, N. J., in erection of the New York Elevated Railroad. SUPPLEMENT, No. **189.** Price 10 cents.

© 1881 SCIENTIFIC AMERICIAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. **Price Ten Cents each Number.**

Civil Engineering.

THROSTLE NEST BRIDGE, MANCHESter, Eng.—A. Fowler, engineer. 10 elevations and perspective view. SUPPLEMENT **69** Price 10 cents.

THE SOUTH PASS JETTIES. BY MAX E. Schmidt, C.E. A paper read before the Convention of the American Society of Civil Engineers. Embracing a general description of works, together with abstracts of the plans and specifications of the works which were adopted for consolidating the Jetties; the constructions at the Sea end of the Jetties; comprising a full description of the novel mode adopted in the construction and deposition of the Concrete Blocks, the machinery and implements employed, the ingredients composing the Concrete and how mixed; accompanied by a table of Cement tests, etc. Illustrated with 17 engravings of machinery, sections, charts, plans, etc. Contained in SUPPLEMENT Nos. **200** and **201**. Price 10 cents each.

THE PROPOSED NEW IRON BRIDGE over the St. Lawrence River, at Montreal.—By Charles Legge, C.E. 5 engravings. SUPPLEMENT **13.** Price 10 cents.

BROWN'S TRAMWAY LOCOMOTIVES. —Descriptions and sectional views of tramway locomotives built by the Swiss Locomotive and Machine Works. These locomotives are combined with the car in such a way that the weight of the latter tends to increase the friction of the driving wheels on the tracks, whereby the dead weight to be overcome is decreased. Illustrated with twelve figures. Contained in SUPPLEMENT **222.** Price 10 cents.

CURIOUS WEAR OF RAILS.—SUPPLEMENT **300.** Price 10 cents.

WATER VELOCIPEDE.—ILLUSTRATed. SUPPLEMENT **294.** Price 10 cents.

DREDGER, SINGLE BUCKET.—ILLUStrated. SUPPLEMENT **299.** Price 10 cents.

WELLAND CANAL.—ILLUSTRATED. SUPPLEMENT **300.** Price 10 cents.

GAS MOTOR, BOTTCHER'S.—ILLUStrated. SUPPLEMENT **302.** Price 10 cents.

THE PANAMA CANAL.—PROGRESS OF the Survey for, with panoramic view of the canal as planned by M. de Lesseps. SUPPLEMENT **305.** Price 10 cents.

STEEL.—PRESIDENTIAL ADDRESS BY J. Robinson, before Section G, British Association, August, 1879. An able review of the development of Steel during the last forty years in its mechanical and economic aspects, pointing out the various new processes that have been introduced in its production, and the new applications that have gradually been made of it in the industrial arts. Contained in SUPPLEMENT, No. **197.** Price 10 cents.

BARTHOLDI'S GREAT STATUE OF "Liberty."—An account of the progress of the work of its construction. Illustrated SUPPLEMENT **313**. Price 10 cents.

THE RAVEL GAS MOTOR.—A DEtailed description of a new gas motor. Two large engravings. SUPPLEMENT **313**. Price 10 cents.

LAWSON'S BOILER EXPERIMENTS AT Pittsburg, Pa. A full and interesting account of Mr. D. T. Lawson's experimental boiler explosion by the author. Three engravings. SUPPLEMENT **313**. Price 10 cents.

SUN ENGINE.—DESCRIPTION AND illustration of Mouchot's engine worked by the Sun. SUPPLEMENT **167**. Price 10 cents.

COMBINED GAS, STEAM, AND AIR Engine. Description and diagrams of a machine of improved type. SUPPLEMENT **168**. Price 10 cents.

THE WONDERFUL RAILWAYS OF Peru. By Dr. Heath. SUPPLEMENTS **165** and **166**. Price 10 cents each.

GUN COTTON.—NEW MILITARY APplications. SUPPLEMENT **165**. Price 10 cents.

BLASTING BY MEANS OF COMpressed Air. By W. E. Garforth. SUPPLEMENT **188**. Price 10 cents.

NEW FRENCH RAILWAY APPLIances.—Descriptions of various new useful apparatus; illustrated with 8 cuts. SUPPLEMENT **176.** Price 10 cents.

A NEW BLASTING COMPOUND.—SUPPLEMENT **176.** Price 10 cents.

NEW WATER ENGINE.—DESCRIPtion of a new water-pressure motor; with 8 cuts, showing details of mechanism. SUPPLEMENT **180** Price 10 cents

HOW MUCH WILL A LOCOMOTIVE Pull? SUPPLEMENT **184**. Price 10 cents.

IMPROVED FILTERS.—MAIGNEN'S System. With two cuts. SUPPLEMENT **215**. Price 10 cents.

PURIFICATION OF SMOKE.—DESCRIPtion and figures of apparatus for washing smoke from factory and other chimneys. SUPPLEMENT **223**. Price 10 cents.

ENDLESS-RAIL RAILWAYS.—DEscription of Clement Ader's system; with two illustrations. SUPPLEMENT **211**. Price 10 cents.

SHAFTINGS, COUPLINGS, AND HANGers.—Descriptions of various forms; with nine figures. SUPPLEMENT **205**. Price 10 cents.

THE LONGEST BRIDGES OF THE World. SUPPLEMENT **256**. Price 10 cents.

SIR WILLIAM THOMSON'S SIPHON Recorder.—Description and figures of the apparatus and mode of operation. SUPPLEMENT **255**. Price 10 cents.

THE THEORY OF THE COMPOUND Engine. With two cuts. SUPPLEMENT **204**. Price 10 cents

AMERICAN ENGINEERING AS ILLUStrated by the American Society of Civil Engineers at the Paris Exhibition of 1878. Compiled by George S. Morrison, Edward C. North, and John Bogart, committee.

I. FOUNDATIONS.—Towers of the Suspension Bridge between New York and Brooklyn. The piers of the St. Louis Bridge. The St. Charles Bridge over the Missouri River. The Poughkeepsie Bridge. SUPPLEMENT **187.**

II. BRIDGE SUPERSTRUCTURE.—Howe Truss Bridge. Introduction of Iron Bridges. The Old and New Viaducts of Cortage, N.Y. The New Bridge Bridges built by the Delaware Bridge Co. Passaic Draw Bridge. Oak Orchard Viaduct. Rockville Bridge. SUPPLEMENT **188.**

III. The Illinois and St. Louis Bridge. Girard Avenue Bridge, Philadelphia. Bridge over the Delaware at Port Jervis, N.Y. Iron Railroad Bridge over the Ohio at Louisville, Ky. Rock Island Draw Bridge. Kentucky River Bridge, Cincinnati Southern R.R. Bridge over Pennsylvania R.R. at 41st street, Philadelphia. Cincinnati Southern R.R. Bridge over the Ohio River at Cincinnati. Point Bridge, Pittsburg, Pa. Iron Derricks used by the Passaic Rolling Mills in erecting the New York Elevated Railroad. SUPPLEMENT **189.**

IV. HYDRAULICS.—Water as applied to Commercial Industries and Domestic Purposes within the United States. American Canals. Water Powers. American Water Wheels. Hydraulic Engineering in California. Water Supply of American Cities. The Sandusky Stand-pipe. American Pumping Engines. Pumping Engine at Lawrence, Mass. Pumping Engines of St. Louis Waterworks. Worthington's Duplex Pumping Engine. Holyoke Dam and Canal. Dam across the Mohawk at Cohoes, N. Y. SUPPLEMENT **193.**

V. INTERNAL NAVIGATION.—Construction of Ferry-boat and arrangement of Ferry-ships and Bridges of the Erie Railroad Ferry of New York. Account of the Powles Hook Steam Ferry-boat, in a letter to Dr. David Hosack from Robert Fulton (with a cut showing Fulton's sketch of his ferry system) Mississippi River Ferry-boats. Steamers "City of New York" and "City of Boston." Steamer "Massachusetts." SUPPLEMENT **199.**

VI. RAILROAD ROLLING STOCK.—Consolidation Locomotive built for Erie Railway by Brooks Locomotive Works. First-class Passenger Coach, built by Wabash R.R. Co. Locomotive and Passenger Train, Pennsylvania R.R. SUPPLEMENT **203.**

VII. RIVERS AND HARBORS. VIII. GAS ENGINEERING.—With one figure. SUPPLEMENT **206.**

The numbers containing the above valuable papers may be had at **10** cent each or **70** cents for the series.

WHAT TO DO WHEN THE LOCOMOtive breaks down. A valuable, practical, paper by F. C. Smith, M.E., giving plain directions for management of the Locomotive; (1) When the engine gets off the track. (2) If the main rod breaks. (3) If a leading wrist pin breaks. (4) If a valve stem breaks. (5) If the back-up excentric rod breaks. (6) If the lifter tumbling shaft breaks. (7) In case of a broken reach rod. (8) For broken excentric straps. (9) In case of a broken spring hanger. (10) A broken equalizer. (11) A broken front truck wheel or axle. (12) An unshipped throttle. (13) A bursted flue. (14) If a driving axle breaks. (15) A broken cylinder head. (16) If the steam chest or branch pipe breaks. (17) If a tender axle or wheel breaks. (18) If the steam pipe breaks inside the boiler. Full of useful advice. SUPPLEMENT **314.** Price 10 cents.

INFANCY AND CHILDHOOD OF THE Steam Engine.—By C. M. Percy, M.E. SUPPLEMENT **305.** Price 10 cents.

COMPRESSED AIR MOTORS. BY GEN. H. Haupt, C.E. Being a Report to the Pneumatic Tramway Engine Co. of New York, concerning the use of Compressed Air as a Motor for propelling Street Railway Cars. Exhibiting the feasibility of the system and the Practical Success obtained as evinced by trials of the Pneumatic Cars and Compressors on the Second Avenue Railway, New York City. With a general description of the Air Compressors, the percentages of Power Realized out of the Power Consumed in pressing the air; the extent of the air compression and how used in connection with heat in the car; the cost per mile; the distance traveled by the Pneumatic Motor; increase of power by using the cylinders as air pumps; heat and cold by compression and expansion; what grades the Pneumatic Motor can overcome and what load it can carry; theoretical test of compressors; capacity of the Second Avenue compressors; effects of using a compression of fifty atmospheres; advantages and objections to use of pneumatic motors; moral and sanitary influences; estimate of the cost of power by the use of the pneumatic system as compared with horses; cost of operating the pneumatic motors on the Second Avenue railway; tables showing the quantities of air consumed on each trip of the car, the reductions of pressure, etc., with many other interesting and valuable particulars, theoretical and practical. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **176, 177**, and **182.** Price 10 cents each.

A FLY-WHEEL ACCIDENT.—WITH drawings, showing the faulty constructon of the fly-wheel, the reasons for the breakage; with practical directions for the avoidance of such occurrence. By Joshua Rose. SUPPLEMENT **30.** Price 10 cents.

THE HYDRAULIC RAM. HISTORY OF its invention. The latest improvements and working of the ram: most successful Dimensions, Valve Seats, etc. Fischer's Ram and others. SUPPLEMENT **111.** Price 10 cents.

BOILER TEST, MANCHESTER STEAM Users' Association. Series of highly important tests made by subjecting boilers to hydraulic pressure to the bursting point, and exhibiting the weakening effects of steam necks, manholes, etc. Twelve illustrations. SUPPLEMENT **74.** 10 cents.

ENGINE OF THE STEAMER HUDSON. 1 page of engravings. General description; also table of dimensions and performances of the single engine steamers Hudson, Knickerbocker, and New Orleans of the Cromwell line. SUPPLEMENT **61.** 10 cents.

PUMPING ENGINE OF THE LEHIGH Zinc Works. Two pages of engravings. SUPPLEMENT **32.** Price 10 cents.

LOCOMOTIVES AT THE PARIS EXHIBItion.—Engines for the Western R.R. of France, built by MM. Ernest Gouin et Cie. Full Description and Dimensions, with Three Elevations and Two Sections to Scale. Contained in SUPPLEMENT **135.** Price 10 cents.

BALDWIN LOCOMOTIVE.—LARGE ENgraving in sectional elevation, with measures, scale, and table of dimensions. SUPPLEMENT **38.** Price 10 cents.

EXPRESS PASSENGER LOCOMOTIVES, Great Western R.R. With five engravings, and tables of all the principal dimensions. SUPPLEMENT **58.** Price 10 cents.

STANDARD FREIGHT CARS OF THE New York Central and Hudson River R'ys. With working drawings and full specifications, showing dimensions and all particulars. Designed by Leander Garey, Supt. of Cars. With eight engravings. SUPPLEMENT **18.** 10 cents.

CORNISH PUMPING ENGINES OF THE Hull Water Works. Two pages of engravings, to scale. With description. SUPPLEMENT **17.** Price 10 cents. Valve gear and parallel motion of same engine, one page of engravings, to scale. SUPPLEMENT **23** Price 10 cents.

ASHWORTH'S COMPOUND ENGINE, with Variable Expansion Gear. With nine illustrations. SUPPLEMENT **28.** Price 10 cents.

FRANCQ'S FIRELESS LOCOMOTIVE.—Full page illustrations of a form of fireless engine now doing successful service on the railway between Rucil and Marly-le-Roy, showing the engine in perspective and in section, and its working parts in detail, accompanied by complete explanatory text. SUPPLEMENT, No. **174.** Price 10 cents.

STEAM FOR SMALL BOATS.—REports of Trials of Steam Yachts, giving description of engines, and their management, proportion of boat, engine, and screw, and other valuable facts. With Engravings. SUPPLEMENT **158.** Price 10 cents.

GREAT BLOWING ENGINE; HIGH Speed and Novel Construction.—Built by Weimar Machine Works. An accurate description, giving performances, dimensions, new devices, and five elevations. This engine easily reaches 100 revolutions per minute, with a discharge of 5,000 cubic feet of air at 10 lbs. pressure. SUPPLEMENT **51.** 10 cents. Also, in same number, ROOT'S FORCE-BLAST BLOWERS, GAS EXHAUSTERS, AND BLACKSMITH'S TUYERES. 12 figures.

ENGINES OF THE "BRITANNIC." THE Fastest Ocean Steamer in the world. Two elevations of engines, four Indicator Diagrams, dimensions, etc. SUPPLEMENT **51.** 10 cents

LOCOMOTIVE FOR BURNING PETROleum.—Used on Russian Railways. With description and five illustrations. SUPPLEMENT **63.** 10 cents.

ENGLISH RAILWAY CAR COUPLINGS. A valuable treatise, showing the existing construction and the character of improvements wanted. With twenty engravings. SUPPLEMENT **21.** 10 cents.

FIRELESS AND HOT WATER LOCOmotives.—History of the inventions on this subject, giving Dates of Patents, etc. Description and Working of Apparatus, etc. SUPPLEMENT **111.** 10 cents

COMPRESSED AIR STREET RAILWAY Car.—Description, with engravings, dimensions, and particulars of the Mekarski Street Cars, now used in Paris, and propelled by compressed air. SUPPLEMENT **18.** 10 cents.

DR. SIEMENS' GAS AND COAL FIRE grate.—Description and figures of an improved grate devised by Dr. Siemens for burning coke and gas, with the result of attaining a warmer and cheaper fire than that given by coal, and with the other advantages in its favor that it is thoroughly smokeless and can be lighted or put out at any moment. Contained in SUPPLEMENT **266.** Price 10 cents.

COMPRESSED AIR MOTIVE POWER.—With drawings and particulars of the most recent practice. The locomotives worked by compressed air in use in St. Gothard Tunnel Works, with dimensions, etc. Five engravings. SUPPLEMENTS **1** and **2.** Price 10 cents each.

LOCOMOTIVES.—SPECIFICATIONS, Dimensions, etc., of the Tank Locomotives of the London, Chatham and Dover R. R. With three engravings. SUPPLEMENT **23.** Price 10 cents.

GAS-FIRED STEAM BOILERS.—A DEscription of some of the more successful of recent efforts to construct furnaces for heating boilers with the least possible consumption of fuel. Muller and Fichet's producer and its merits and defects. Heartmann's Furnace. Heaupt's new arrangements of firebrick arches for obtaining a thorough mixture of gas and air. Full account of trials made with the latter, and the successful results obtained. Illustrated with sixteen figures. Contained in SUPPLEMENT **219.** Price 10 cents.

CLEOPATRA'S NEEDLE.—ITS REMOVal from Egypt to England. Details, with 9 engravings. SUPPLEMENT **69.** Price 10 cents.

FRICTION. A SERIES OF EXPERIments on Friction, proving the falsity of the former formulas thereon, and giving others in accordance with actual results. By Prof. A. S. Kimball. SUPPLEMENT **76.** Price 10 cents.

COMPRESSED AIR PNEUMATIC DISpatch System used in Paris. With description and 12 illustrative figures. SUPPLEMENT **24.** Price 10 cents.

NARROW GAUGE RAILWAY.—THE Billerica and Bedford, Mass., Two-foot R.R. 4 illustrations. The Route, Grades, Cuts, Curves, Ties, Ballasting, Culverts, Bridges, and Rails. The Locomotives, with particulars, engravings, and dimensions. Particulars and Dimensions of other Rolling Stock. Equipment and Cost of Road. SUPPLEMENT **115.** Price 10 cents.

GIRARD AVENUE BRIDGE.—A DEscription, with dimensions, working drawings, and perspectives of Girard Avenue Bridge, Phila., Pa. With foundations of piers. 10 engravings. SUPPLEMENTS **1, 2,** and **4.** Price 10 cents each.

GREAT CORLISS ENGINE AT THE CENtennial.—Dimensions and general description. With full page perspective engraving, and two pages of outline drawings made to scale. SUPPLEMENTS **19, 26, 36.** Each 10 cents.

EIGHTEEN OUTLINE FIGURES OF Locomotives exhibited at the Centennial, showing their measures, with a table of principal dimensions of each locomotive. SUPPLEMENT **35.** Price 10 cents.

NARROW GAUGE LOCOMOTIVES. INdian State Railways, engraving and dimensions. SUPPLEMENT **53.** 10 cents.

BOILER INSPECTION. RULES OF THE English Board of Trade. Instructions to Surveyors. Working Pressure for Cylindrical Shells of Boilers. Conditions and Factors of Safety. Formula for Determination of Strength, etc. Also, CORROSION IN BOILERS. Report to the French Steam Boiler Commission, by M. Hanet Clery, on the corrosion of boilers by sulphuric acid deposited by smoke. Full and instructive accounts of several explosions. SUPPLEMENT **104.** Price 10 cents.

RACK RAILWAY LOCOMOTIVE OF the Kahlenberd Railway near Vienna. Five elevations, and all particulars. SUPPLEMENT **70.** 10 cents.

MARINE ENGINE. BY CRAMP & SONS. Large engraving. SUPPLEMENT **30.** Price 10 cents.

NEW AIR COMPRESSOR OF M. DUBOIS, with description, dimensions. Illustrated by engravings. SUPPLEMENT **22.** Price 10 cents.

NEW UNITED STATES GOV'T RULES in respect to Boilers, Boiler Inspection, Stamping and Testing of Boiler Plates, Fire Apparatus, and Boat Lowering Devices and Life Preservers. Instructions to Inspectors, and Tests of Boiler Material are to be made and recorded. Requirements in Construction of Boilers. The Law in full, with List of approved Fire Extinguishing, Life Saving, and Boat-lowering Apparatus. SUPPLEMENT **113.** 10 cents.

ON THE CAUSES OF KNOCKING IN high pressure engines.—By Joshua Rose. With nine engravings. A valuable practical treatise. Price 20 cents. SUPPLEMENTS **1** and **2.**

NEW ROAD LOCOMOTIVES.—BY Marshall, Sons & Co. General description and one engraving. SUPPLEMENT **56.** Price 10 cents.

STEAM STREET RAILWAY CARS. BY A. Brummer, M.E. Economical, no noise, effective. With working drawings of car, engine, boilers, dimensions, and full particulars. SUPPLEMENT **22.** 10 cents.

ROCK-BORING MACHINERY.—FROM the Work of R Schram. Comparative Merits of the several Systems; the Ram, the Lever, the Duplex, the Rotary, and the Direct-acting. The Burleigh, Sach, Warrington, Ferroux, Brandt, Osterkamp, Lisbeth, Reynolds, and other Machines, with Interesting Trials and Practical Experience with each. SUPPLEMENT **140.** Price 10 cents. Also, in same number, COMPRESSED AIR IN MINES. By M. G. Johnson. Its first use in the Mont Cenis Tunnel and Economy. Loss of Power by Loss of Heat; the Cold produced. High vs. Low Pressures. Description of the Kingswood Coal and Iron Company's Machines, with a Curious Circumstance.

NEW RAILWAY LOCOMOTIVE CRANE, by Black, Hawthorne & Co. 4 engravings to scale, dimensions, etc. SUPPLEMENT **54.** 10 cents.

ON THE PRIMING OF STEAM BOILERS. By Wm. Major, Engineer, Danish Navy. Read before Society of Engineers. Two figures. An Important Paper, explaining a new and probable theory of the cause of Priming; giving Experiments on the subject, and enumerating the advantages of substituting Petroleum for Tallow in Boilers, to prevent Priming. SUPPLEMENT **82.** 10 cents.

LIQUID FUELS.—BY H. AYDON. A paper read before the Institution of Civil Engineers, London. The five methods of burning liquid fuel, C. J. Richardson's, Simm and Barff's, Aydon's, and Dorsett's. Practical Working of each method, and comparative economy. SUPPLEMENT **119.** Price 10 cents.

NEW METHOD OF BALANCING THE Winding Engines of the Deep Shafts of Westphalia.—By W. Fairley. A Simple, Practical Contrivance, with Description of Construction and Working, and three diagrams. SUPPLEMENT **117.** Price 10 cents.

PASSENGER ENGINES OF MIDLAND Railway, with table of dimensions. 3 engravings. SUPPLEMENT **27.** Price 10 cents. The same number contains report of valuable information given before the Master Mechanics' Association, concerning Locomotives and Locomotive improvements.

NARROW GAUGE SWEDISH LOCOMOtive, with a page of engravings. SUPPLEMENT **41.** Price 10 cents. Locomotives of the EIGHTEEN-INCH RAILWAY at Crewe, Eng. Two engravings. SUPPLEMENT **44.** 10 cents.

STRONG AND CHEAP SPAR BRIDGES. Description, dimensions, and particulars, with 2 pages of drawings, covering illustrations of all the details, for a bridge of 100 feet span or less: specially useful for crossing of creeks, small rivers, gullies, or wherever a costly structure is not desirable. The drawings are from the Spar Bridge exhibited at the Centennial, in the U. S. Department of Military Engineering. These bridges are wholly composed of undressed stuff. SUPPLEMENT **71.** Price 10 cents.

SETTING GAS RETORTS.—AN ABLE and concise practical treatise upon the subject, illustrating the latest and best methods now in use. With 8 illustrations. SUPPLEMENT **22.** Price 10 cents.

BALANCING PULLEYS AND OTHER Rotating Parts of Machinery.—A paper of extreme practical importance to all who have anything to do with machinery; describing an apparatus for the production of a "running balance," and presenting the deductions from experiments which have been made with it, and which have proved deeply interesting to all who have witnessed them. Illustrated with thirteen figures. Contained in SUPPLEMENT **221.** Price 10 cents.

STEAM BOILER ECONOMY. A SERIES of Important Experiments by the Societe Industrielle de Mulhouse, showing the comparative economy of various types of boiler. Seven illustrations. SUPPLEMENT **76.** 10 cents.

ROCK-DRILLING MACHINES. BY JOHN Darlington. Tools, described and illustrated. Best Practice in Size of Holes, Kind of Explosive, etc. Machines and Tools, Air Pressure, etc., used at Mont Cenis, St. Gothard, Musconetcong, Maesteg, Cwmbran, Port Skewet, Saarbruck, Ronchamp, Blanzy, Minera, and Ballacockish Tunnels, with three illustrations of Methods of Drilling. The Cut System, Brain's Radial, and other Systems. SUPPLEMENT **103.** Price 10 cents.

TURBINE WATER WHEELS.—A REport of the Official Tests of Turbine Water Wheels made during the Centennial Exhibition of 1876. With thirty one illustrations. Embracing Drawings and Descriptions of the apparatus used for each test. The Instruments employed for determining the Power and Revolutions of each wheel. Engravings and descriptions showing the Construction of the wheels that exhibited the Greatest Efficiency. Table showing the Names of the Exhibitors of the several wheels tested. Date of each test. Diameter of wheel. Fraction of gate. Weight on the scale in pounds. Revolutions per minute. Horse Power of wheel. Head on wheel, in feet. Head on weir, in feet. Flow over weir. Head on weir due to leakage. Horse Power of the water used. Percentage of efficiency realized by each wheel. Together with other valuable and interesting particulars. SUPPLEMENTS **59** and **61.** Price 10 cents each.

STEAM ENGINES AND BOILERS FOR High Pressures. By Loftus Perkins. Benefits of High Pressure, with practical plans and specifications of successful Engines and Boilers now in use, with Indicator Diagram. SUPPLEMENT **81.** 10 cents.

THORNYCROFT'S SCREW PROPELler.—Used on the fastest small steam launches in the world. With two illustrations, and an account of Trials. SUPPLEMENT **77.** Price 10 cents. In the same number is a description and engraving of a Paddle Engine for light draught steamboats. The firing of boilers, etc.

© 1881 SCIENTIFIC AMERICIAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Mechanical Engineering.

HIGH RAILWAY SPEEDS.—BY W. Barnet Le Van. Description of trial trip of the "new departure" locomotive No. 5,000 (made by Burnham, Parry & Co.), from Philadelphia to Jersey City and return. Account of speed made between stations going and coming. Steaming capacity of the new locomotive's boiler. Water consumed. Best speed made, 81 miles per hour. Table of speeds in miles per hour of the *fast lines* in Europe and America. Contained in SUPPLEMENT **240**. Price 10 cents.

THE EFFECT OF PUNCHING OF IRON and Steel Plates.—By A. C. Kirk. Read before the Institution of Naval Architects. The Weakening Effects of Punching *vs.* Drilling in Riveting. Experiments with Six Tables for Iron and Steel, giving Strain brought to bear, Elongation, and all particulars of the effects of Punching and Drilling, and six illustrations; also Hardening and Tempering of Steel, by Joshua Rose. SUPPLEMENT **95**. Price 10 cents.

STEAM TROLLY OR CHAIR. USED ON Oude Railway. Two engravings. SUPPLEMENT **63**. 10 cents.

THE MORRIS BLOWING ENGINE, with two pages of illustrations. SUPPLEMENT **39**. Price 10 cents.

STEAM BOILER FURNACES FOR Smoke Prevention.—By John W. Hill, M.E. Full descriptions of the fire systems of steam boiler furnaces designed to burn bituminous coal without smoke, entered in competition at the Cincinnati Industrial Exposition of 1879, with detailed reports of the various tests made and the results obtained. The Walker Twin Furnace. The Fisher Furnace. The Eureka Furnace Attachment. The Murphy Furnace. The Price Furnace. Contained in SUPPLEMENT **213**. Price 10 cents.

THE FONTAINE LOCOMOTIVE. — A paper by Mr. John Ortton, of the Canada Southern Railway, giving the details of construction and performance of the locomotive engine "Fontaine," which differs from ordinary locomotives in the peculiar mode of applying the power of the engine to the wheels. With three engravings. SUPPLEMENT **305**. Price 10 cents. A further discussion of the same subject in SUPPLEMENT **311**. Price 10 cents.

NEW SCANDINAVIAN DRIVING BAND. —A paper read by W. Willson Cobbett, before the Society of Foremen Engineers, wherein the author describes the recently introduced woven belting, manufactured in Sweden, and claims superiority for it in point of simplicity, efficiency, and economy over leather, rubber, or canvas belts. Followed by discussion of the subject by the members, and table showing results of experiments made to test the comparative pliability of the Scandinavian and leather beltings. Contained in SUPPLEMENT **239**. Price 10 cents.

GAS MOTORS. — DESCRIPTION, ACcompanied by eight figures, showing details of working parts of a system of small gas motors as made by Buss, Sombart & Co. Contained in SUPPLEMENT **265**. Price 10 cents.

AN EASILY MADE SMALL, STRONG, and Cheap Boiler for little Steamboats.—By H. K. Stroud. With an engraving This excellent little boiler is made of wrought iron mercury flasks, which may be readily obtained, ready for use. Seven flasks are screwed together with ordinary gas fittings. This boiler has been used for a year past, with much success, in the steam Sharpie yacht Mannelita. Length of boat, 16 ft. 5 in.; beam, 4 ft. 6 in.; propeller, 16 inches diameter. For further description of boiler, boat, and engine, with method of securing the propeller in stern post, see SUPPLEMENT **182**. Price 10 cents.

LIQUID FUELS FOR STEAM ENGINES. —The opinion of an expert as to the economic value of naphtha as a substitute for coal in the production of heat and the generation of motive power. The recent experiments on the Long Island Railroad with naphtha fuel, and their results. Claims of the inventor of the Holland hydrocarbon retort. The modus operandi of the apparatus, and a criticism of the inventor's claims. Contained in SUPPLEMENT **238**. Price 10 cents.

LOCOMOTIVE ENGINEERING. — THE most recent and best examples of Locomotive Construction, with scale drawings, tables of principal dimensions, general description, etc., are given in the SCIENTIFIC AMERICAN SUPPLEMENT. The following may be had at this Office, or ordered through any Newsdealer. Sent by mail prepaid. Please order by the *numbers* here given.

Express Locomotives of the London, Chatham, and Dover R. R. Tank Locomotives. With Specifications, Dimensions, Particulars and Three Engravings. SUPPLEMENT **23**. 10 cents.

Locomotives at the Centennial. A series of Eighteen Outline Illustrations, showing the Principal Locomotives exhibited at the Centennial, with their measures, and a table of principal dimensions of each locomotive. SUPPLEMENT **35**. 10 cents.

Baldwin Locomotive. — Large engraving in sectional elevation, with measures, scale, and table of dimensions. SUPPLEMENT **38**. 10 cents.

Narrow Gauge Swedish Locomotive, with one page of engravings. SUPPLEMENT **41** 10 cents.

Locomotives of the Eighteen Inch Railway at Crewe, Eng. Two engravings. SUPPLEMENT **44**. 10 cents.

Locomotive Passenger Engines of Midland Railway with table of dimensions. Three engravings. SUPPLEMENT **27**. 10 cents. The same number contains report of valuable information given before the Master Mechanics' Association, concerning Locomotives and Locomotive improvements.

Narrow Gauge Locomotives, Indian State Railways, engraving and dimensions. SUPPLEMENT **53**. 10 cents.

New Railway Locomotive Crane, by Black, Hawthorne & Co. Four engravings to scale, dimensions, etc. SUPPLEMENT **54**. 10 cents.

New Road Locomotive, by Marshall Sons & Co. General description and one engraving. SUPPLEMENT **56**. 10 cents.

Express Passenger Locomotives, Great Western Railway With five engravings. and tables of all the principal dimensions. SUPPLEMENT **58**. 10 cents.

Locomotive for Burning Petroleum.—Used on Russian Railways. With description and five illustrations. SUPPLEMENT **63** 10 cents.

Steam Trolly or Chair.—Used on Oude Railway. Two engravings. SUPPLEMENT **63**. 10 cents.

GAMGEE'S NEW MOTOR—THE AMmonia Engine.—Specifications and drawings in full of the patent granted Prof. Gamgee on his "Thermo-Dynamic Engine." Prof. Newcomb's opinion of the "Zeromotor," and Prof. Gamgee's reply thereto. Illustrated with five figures, showing elevation, sections, and plan of apparatus. Contained in SUPPLEMENT **281**. Price 10 cents.

ENGINES OF THE LOUDOUN Castle, a Fast Ocean Steamer.—Three elevations, dimensions, and description. SUPPLEMENT **79**. Price 10 cents.

TO ESTIMATE THE HORSE-POWER OF a Steam Engine.—Simple rules for estimating the horse-power of a high-pressure or non-condensing engine, and of a low-pressure or condensing engine. By a Practical Engineer. Contained in SUPPLEMENT **253**. Price 10 cents.

THE PROGRESS AND DEVELOPMENT of the Marine Engine.—By F. C. Marshall, M.E. A paper lately read before the Society of Mechanical Engineers, London. Decidedly the most useful, reliable, and valuable recent contribution upon the subject, showing the history and progress of marine engineering, describing the most approved types of engines and boilers now employed, the materials and mode of manufacture, performances and economies, the consumption of fuel, results of the screw propeller, suggestions for improvement. Contained in SUPPLEMENT **299**. Price 10 cents.

INFANCY AND CHILDHOOD OF THE Steam Engine.—By C.M. Percy, M.E. An exceedingly interesting history of the rise of the Steam Engine and its progress up to the time of James Watt. Hero. De Garay and Porta. Solomon de Caux. Branca. The Marquis of Worcester. Atmospheric Pressure. Savery. Papin. Newcomen. Contained in SUPPLEMENT **305**. Price 10 cents.

THE FERRY STEAMER LOFTUS PERkins.—Description of Perkins engine built for one of the ferry boats of the Tyne General Ferry Company, in order to secure greater economy in the working of their steamers. Boat 100 ft. long, 13 ft. 10 in. beam, and 6½ ft. deep. Illustrations showing every part of the engine in detail; sectional elevation and plan of the high pressure cylinder; sections of inlet valves; sections of exhaust valves; section, elevation, and plan of the medium cylinder; section, elevation, and plan of the low-pressure cylinder; sections of the inlet valve to the high-pressure cylinder, and of the exhaust valve from the same. Three full page illustrations accompanying the text. Contained in SUPPLEMENT **217**. Price 10 cents.

THE DeBAY PROPELLER.—DESCRIPtion of one of the most efficient propellers that has thus far been constructed, with details of experimental trials to test its practical working. Illustrated with thirteen figures, showing stern of the steamship Cora Maria with the DeBay propeller; sectional elevation of the propeller gearing; details of the screw-blade connections, and the propeller as fitted to the ship. Contained in SUPPLEMENT **250**. Price 10 cents.

THE VALUE OF A VACUUM. — AN article of interest to the engineer, wherein the author very ably discusses the maximum value of condensers, points out that there are circumstances under which it is more economical to exhaust steam directly into the air than to condense it, and proves that the use of condensers, under such conditions, hence works more injury than benefit. Contained in SUPPLEMENT **276**. Price 10 cents.

TRANSMISSION OF POWER TO A DIStance.—By Arthur Achard. A paper read before the Institution of Mechanical Engineers. Being a summary of the practical results obtained in the transmission of power to a distance by different modes. I. Transmission of Power by Wire Ropes, and the formulæ for calculation. II. Transmission by compressed air, with formulæ. III. Transmission by Pressure Water, with formulæ. IV. Transmission by Electricity. General results obtained by the several methods. This is one of the most valuable, practical, and comprehensive papers on the subject recently published. Contained in SUPPLEMENTS **274** and **275**. Price 10 cents each.

SPRING MOTORS.—A SERIES OF VAluable papers illustrating the latest methods of applying springs for the propulsion of street cars and light road carriages. With plans and drawings of methods of construction and winding of the springs, length and power of springs, resistances, etc. Illustrations and descriptions of methods for driving sewing machines and other light machinery by spring power. Contained in SUPPLEMENTS **46, 47, 48, 50**. Price 10 cents each; 40 cents or the series.

THE QUALITY OF STEAM.—A VALUable paper read before the American Railway Master Mechanics' Association, June, 1881, by John W. Hill M.E., showing the necessity of an exact knowledge of the thermal value of steam in estimating the economy of engine and boiler performance. Contained in SUPPLEMENT **302**. Price 10 cents.

THE EFFICIENCY OF SCREW PROpellers.—Descriptions, Illustrated with Diagrams, of results obtained in some interesting experiments with propellers by Messrs. Farrell & Co., in England, in order to determine the most suitable screw for a torpedo boat built by them for the Admiralty. Contained in SUPPLEMENT **208**. Price 10 cents.

STATIONARY BOILERS. — OFFICIAL Tests at Centennial Exhibition. Description of Experiments on Fifteen Boilers of various kinds, and comparative tabular statement, giving pressure in Boiler, Temperature of Steam, Moisture of Steam, and amount of Superheating, Water Evaporated, Coal Consumed, Rating of Boiler, and many other particulars. Also, Coal and Firing, Percentage of Refuse. Calorimetric Observations, etc. Contained in SUPPLEMENT **89**. Price 10 cents.

RECENT BRAKE TRIALS.—AN ACcount of a series of important experiments recently carried out by the Lancashire and Yorkshire Railway Company to ascertain the relative merits of the Westinghouse, the Eames, and the Sanders automatic brake, and Fay & Newall's hand brake; with a table showing the broad facts of the trials. Contained in SUPPLEMENT **246**. Price 10 cents.

STEAM FOR SMALL BOATS.—REports of Trials of Steam Yachts giving description of engines and their management, proportion of boats, engine, and screw, and other valuable facts. With engravings. Contained in SUPPLEMENT **158**. Price 10 cents.

THE BOLLEE STEAM CARRIAGE.— Description of a new steam carriage for common roads, as recently described by Herr Kesseler before the German Verein fur Eisenbahn Kunde. With four figures, giving perspective, sectional elevation, and plan views of the apparatus. Contained in SUPPLEMENT **291**. Price 10 cents.

COMPRESSING AIR.—BY JOHN STURgeon. An important paper, showing the most efficient and economical way of effecting the compression of air for use as a motive power. Illustrated with engraving of an air-compressor for obtaining low pressures. Contained in SUPPLEMENT **279**. Price 10 cents.

CONSOLIDATION LOCOMOTIVE FOR the Philadelphia and Reading Railroad. Dimensions and perspective and back-end views of one of the heavy freight engines recently built for the Reading Railroad by the Baldwin Locomotive Works; with account of trial trips and details of performances. Contained in SUPPLEMENT **252**. Price 10 cents. The same number contains an interesting article on "Fast Passenger Locomotives."

DISTILLING AND HOISTING MACHINery for Sea-going Vessels.—By Hamilton W. Pendred. Description of Graveley's distiller for seagoing vessels, capable of yielding eighty to one hundred gallons of water per day of ten hours, and suited for a ship of 1,000 to 1,500 tons, Also distiller combined with cooking hearth, by means of which arrangement the processes of cooking and distilling may go on either together or separately. Description of Chaplin & Co.'s distiller and patent aerator, and steam winch. Messrs. Robertson, Osborne & Co.'s horizontal steam winch. Brown's patent fresh water condenser and steam winch. Application and performance of the foregoing apparatus. Illustrated with fourteen figures. Contained in SUPPLEMENT **234**. Price 10 cents.

COST OF WORKING A GAS ENGINE.— By F. T. Linton, of the Leith Gas Works. Experience of the author as to the cost of working a gas engine, with a comparison of the cost of doing the same amount of work by a steam power. A paper of interest and value to engineers. Contained in SUPPLEMENT **248**. Price 10 cents.

RAILWAY VELOCIPEDES.—DESCRIPtion of two styles of Velocipedes for use on the track of railways, and one of which is employed for various purposes by the officials of several of the largest Western railroads. Two engravings. SUPPLEMENT, **178**. Price 10 cents.

FOUNDATIONS.—FROM A VERY VALUable paper on the subject of American Engineering, as illustrated by the American Society of Civil Engineers at the recent Paris Exhibition. Compiled by a Committee of the Society, composed of Messrs. George S. Morrison, Edward P. North, and John Bogart. Foundation Work as practiced in America; its characteristics, and the features that distinguish it from European methods. The free use of Timber, Crib Work, Piles, Caissons, Coffer Dams, Screw Piles. The Cushing System. The Towers of the New York and Brooklyn Suspension Bridge. The Piers of the St. Louis Bridge. The St. Charles Bridge over the Missouri River. The Poughkeepsie Bridge over the Hudson River—the boldest example of timber foundation on record. Bridge Superstructure.—Notes on the Earlier styles of American Bridges. The Burr Bridge and the Towne Lattice. The MacCallum Truss. The Pratt Truss. Description of the Howe Truss. Introduction of Iron Bridges. The Squire Whipple Bridge The Fink and Bollman Trusses. The Whipple, Murphy, or Linville Trusses. The Post Truss. The peculiarities of American as compared with European iron bridges. Introduction of Iron Trestles. Smith's Trestle Bridges. Improvements that have taken place in the last ten years. Description of the old and new Viaducts of Portage, New York. The Passaic Draw Bridge; general dimensions, weights adopted for calculation, weight of iron in structure, and general description of the Bridge. Oak Orchard Viaduct; general dimensions, weight of iron in structure, and short description. The Rockville Bridge; a full description of the structure, including the weight of iron used therein and general dimensions. SUPPLEMENTS, **187** and **188** Price 10 cents each.

LARGE PLANING MACHINES.—ILLUStrated. SUPPLEMENT **310**. Price 10 cents.

CLERK'S GAS ENGINE.—ILLUSTRATed. SUPPLEMENT **310**. Price 10 cents.

SIEMENS REGENERATIVE GAS BURNer.—Illustrated. SUPPLEMENT **301**. Price 10 cents.

PROGRESS AND DEVELOPMENT OF the Marine Engine.—By F. C. Marshall. SUPPLEMENT **299**. Price 10 cents.

HAYWOOD'S FIFTEEN-INCH RAILway.—Illustrated. SUPPLEMENT **296**. Price 10 cents.

DYNAMO-METRIC BRAKES, NEW. — With two figures. SUPPLEMENT **264**. Price 10 cents.

WATER GAS.—A DESCRIPTION OF APparatus for producing cheap gas, and notes on the economical effect of using such gas with gas motors, etc. By J. Emerson Dowson, C.E., of London. SUPPLEMENT **303**. Price 10 cents.

OUR PROGRESS IN MECHANICAL Engineering.—Address by Prof. Robert H. Thurston, Prest. Am. Soc. Mech. Engineers. SUPPLEMENT **308**. Price 10 cents.

THE MONTE PENNA WIRE ROPEWAY. —With seven illustrations. SUPPLEMENT **278**. Price 10 cents.

QUALITY OF STEAM.—BY J. W. HILL, M.E. SUPPLEMENT **302**. Price 10 cents.

LARGE IRON ROOFS.—SUPPLEMENT **307**. Price 10 cents.

Sanitary Engineering.

VENTILATION OF PUBLIC BUILDings.—By James Hogg. An interesting account of the system of ventilation now used in the Madison Square Theater, New York, the most perfectly ventilated public building in this country. A valuable and important paper, with engravings illustrating the system. Contained in SUPPLEMENT **250**. Price 10 cents.

HOUSE DRAINAGE, SEWERAGE, AND Ventilation.—A paper read by Mr. Reginald Middleton before the Society of Civil and Mechanical Engineers, London. Replete with practical information on the above subjects. A paper of value and interest to everybody. Contained in SUPPLEMENT **272**. Price 10 cents.

THE UTILITY OF WATER FILTERS.— A valuable article, pointing out the erroneous ideas held by the majority of people on the subject of filtration; showing that most of the household water-filters in use are constructed on unscientific principles, and are hence valueless; and maintaining that if drinking water needs filtering, the filtration can be best effected by the use of sand, which has always given satisfactory results wherever it has been skillfully used and carefully looked after. Contained in SUPPLEMENT **209**. Price 10 cents.

HOW TO MAKE TROUT PONDS.— Valuable suggestions to fish culturists as to the best mode of constructing ponds for the purpose of spawning and trout raising. Illustrated with a diagram. Contained in SUPPLEMENT **246**. Price 10 cents.

THE FARQUHAR FILTERING APPAratus.—A detailed description of the Farquhar apparatus for filtering the sewage of cities and villages, for the purification of the water supply of cities, and for the continuous filtration, in an economic manner, of large volumes of liquids in general. With seven figures (to a scale) showing vertical sections, plan view, and details of mechanism. Contained in SUPPLEMENT **291**. Another illustrated article on this subject, giving some additional information, may be found in SUPPLEMENT **276**. Price 10 cents each.

SEWAGE DISPOSAL. — BY JAMES Craggs. A condensed but clear description of the plan of sewage and sewer disposal adopted for the Sheldon and East Thickly Local District. Description of main drain, subsiding tanks under drainage, and surface preparation. A valuable paper, showing one of the best, most effective, and most economical methods of sewerage and drainage for towns and villages. Contained in SUPPLEMENT **257**. Price 10 cents.

WARMING AND VENTILATION.—BY D. Galton, R.E. An exceedingly clear and Instructive paper. The Movements of Air in Buildings, and its Passage through Brick Walls, etc. Character of Poisonous Emanations, and How Detected. Cheap and Effective Ventilation, with Economy of Fuel, and no Draughts. SUPPLEMENT **94**. Price 10 cents.

HOUSE DRAINAGE.—BY EDWARD S. Philbrick, C.E. A lecture delivered before the students of the Massachusetts Institute of Technology, discussing the very important subject of the construction of the drains situated within the house walls; pointing out the proper method of arranging the plumbing fixtures, what materials should be used for main drains, soil pipes, small waste pipes, etc., how these should be constructed, and how arranged to effect the most perfect drainage and prevent the exhalations of noxious gases. With three illustrations. Contained in SUPPLEMENT **243**. Price 10 cents. The same number contains an illustrated description of an "Apparatus for Clearing Sewage."

PIPES FOR GAS AND OTHER PURposes. An excellent practical treatise, with 42 illustrations. The various kinds of pipes, chameroy, wood, paper, cement, and slate pipes; the numerous joints, ball and socket, harness, etc. The destructive power of various soils, and the most successful methods of preserving pipe. Extended directions on main laying, giving best practice. SUPPLEMENTS **62, 64, 66, 67, 68, 69, 72, 77**. Price 10 cents each.

THE VENTILATING AND WARMING of School Houses.—By Dr. F. Winsor. Tests of Purity of Air. True Philosophy of Ventilation. Experience in War Proving Importance of Pure Air. Removal of Germs and Stenches. Necessary Cubic Space, and Frequency of Renewal. Proper Humidity. With New School House Design. SUPPLEMENT **98**. Price 10 cents.

DISINFECTANTS AND THEIR SPECIAL Application.—By E. L. Griffin, M.D., President of the State Board of Health of Wisconsin. A valuable treatise on this important subject, enumerating all of the most approved disinfecting agents known, such as: Fresh Stone Lime, Powdered Charcoal, Chloride of Lime, Dry Earth, Sulphurous Acid Gas, Nitrous Acid, Copperas. Permanganate of Potash, Chloralum and Bromo-Chloralum, Chloride, Sulphite and Sulphate of Zinc, Iodine, Carbolic Acid, and Ozone; stating in what particular cases each one should be applied, and giving full directions how it should be used. Contained in SUPPLEMENT **162**. Price 10 cents.

CREMATION IN ITALY.—A DESCRIPtion, by A. B. Archbald, of Florence, of the crematories recently used at Milan, and particularly those of Gorini and of Roma-Venini, both of which have been tested by the Hygienic Congress at the Cimitero Monumentale of that city, preceded by a brief sketch of previous experiments in cremation in Italy and Germany. Contained in SUPPLEMENT **262**. Price 10 cents. Further information on the same subject, accompanied by engravings illustrating the German and Italian crematory furnaces, may be found in SUPPLEMENT **264**. Price 10 cents.

FOOT-WALK PAVEMENTS.—A PAPER read before the Association of Municipal and Sanitary Engineers. By E. Buckingham, C.E. With Directions for Making the Best and Cheapest Walks of Cements and other materials. SUPPLEMENT **82**. Price 10 cents.

DISPOSAL OF SEWAGE.—A PAPER read before the London Institution of Mechanical Engineers, by Mr. Henry Chapman, describing the Farquhar and Oldham filtering apparatus, for the disposal of the sewage of towns and villages; for the purification of the water supply of cities; and for the continuous filtration, in an economical manner, of large volumes of liquid generally. With engravings. Contained in SUPPLEMENT **276**. Price 10 cents. The same number contains an article on "*Paris Water Meters*," giving brief descriptions, with illustrations, of the four types of water meters adopted by the Parisian authorities: Kennedy's meter; Frager's meter; Samain's meter; and Mathelen and Deplechin's meter.

CISTERN WATER.—A REPORT BY Prof. C. R. Stuntz to the Cincinnati Board of Health, on analyses of cistern waters, with table of analyses; deductions and observations by the author, and rules for the management of cisterns adopted by the Sanitary Committee of Cincinnati. Contained in SUPPLEMENT **277**. Price 10 cents.

HOUSE DRAINS AND THEIR COMMON DEFECTS.—By Eliot C. Clarke, C.E., Principal Assistant Engineer in charge of the Improved Sewerage Work, Boston, Mass. With 34 illustrations. An important and Valuable Paper, showing the Essential Conditions for Efficient House Drainage; the proper sizes, forms, and best materials for drains; the evil results of making them too large; the proper inclination for drains; the best methods of making them tight; the right and the wrong methods of connecting drains with sewers, with engravings How leaks in drains occur and how detected. Descriptions of the most common defects in drains, with engravings. Together with many valuable suggestions and directions of great value to housekeepers and owners of property, whether in town or country. This paper is based on the observations of the author during an extended experience in the actual construction of drains and sewers, and presents in concise form the latest and best information on the subject. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **179**. Price 10 cents.

GROUND-AIR IN ITS HYGIENIC RElations.—By Dr. Max Von Pettenkofer, Professor of Hygiene in the Munich University. An important and valuable paper, proving by experiment the existence of underground air-currents; sanitary dangers from the escape of underground air into dwellings. SUPPLEMENT **82**. Price 10 cents.

© 1881 SCIENTIFIC AMERICIAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Sanitary Engineering.

SEWER-GASES, AND THE TRANSPORT of Solid and Liquid Particles therein.—By E. Frankland, F.R.S. Experiments and Practical Experience proving the suspension in the Atmosphere of Solid and Liquid Particles from Sewers, to which matter Cholera and other diseases have been traced. Sanitary Prevention. Other excellent articles on Medical, etc., subjects, as the Treatment of Rheumatism; Croton Chloral in Whooping Cough; School of Life and Myopia; Safe Administration of Chloroform, etc. SUPPLEMENT **67.** Price 10 cents.

HOUSE DRAINAGE.—VALUABLE DIrections for securing perfect drainage for dwellings, as issued by the Massachusetts State Board of Health; showing what size the drains should be, the proper slope to give them, and how they should be connected with the soil pipe and sewer; theimportance of putting a plan to the work on record; the proper way to drain wet sites for houses; method of isolating sewers from houses by traps; the best arrangement for the soil pipe; how to trap water closets, sinks, basins, and bath tubs; the best patterns of water closets; how to detect gross defects in house drainage; how to dispose of sewage where there are no sewers. Illustrated with two cuts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, **194.** Price 10 cents.

THE SEWERAGE OF MEMPHIS.—BY Fredk. S. Odell, C.E. A description of the "separate system" of sewerage as successfully introduced in the city of Memphis. This system has the distinctive feature of employing the sewers for the purpose of conveying sewerage only, surface and subsoil drainage being excluded, and is claimed to be cleaner and cheaper than the ordinary system in use. Illustrated with two figures, showing automatic sewage flush tank. Contained in SUPPLEMENT **284.** Price 10 cents.

PAINT FROM A SANITARY POINT OF View.—Cases described in which White Lead Paint in Dwellings Never Dries, but gives off Poisonous Particles which are Inhaled by the Inmates, causing Depression, Weakness, Headache, and Loss of Appetite. The New Zinc White Recommended, with Covering qualities equal to White Lead. SUPPLEMENT **154.** Price 10 cents.

THE SPONGY IRON FILTER. — BY Gustav Bischof. A paper read before the Royal Society. Defective means of detecting Bacteria and Putrescent Matter in Water, and Sanitary Danger of Water so contaminated. Description of Filter which removes these Organisms, and Experiments proving its value. With other valuable papers on the Origin of Bacteria, the Cell-doctrine in the Light of Recent Investigations, etc. SUPPLEMENT **87.** Price 10 cents.

SEWAGE WORKS FOR SMALL TOWNS. —Designs made by Baldwin Latham, C.E., for the town of Skipton, England. 2 pages of illustrations, giving all the details of this most simple and effective system. SUPPLEMENT **75.** Price 10 cents.

IMPURITIES IN WATER AND THEIR Influence on Domestic Utility.—By George Stillingfleet Johnson. SUPPLEMENT **293.** Price 10 cents.

FURNACES FOR DESTROYING THE Refuse of Cities.—With four figures. SUPPLEMENT **283.** Price 10 cents.

COMMON SENSE SANITATION.—SUPPLEMENT **293.** Price 10 cents.

DISPOSAL OF HOUSE DRAINAGE.—SUPPLEMENT **308.** Price 10 cents.

DRAINAGE OF AN APARTMENT House. Illustrated with one cut. SUPPLEMENT **166.** Price 10 cents.

Military and Naval Engineering.

SMALL STEAMBOATS AND YACHTS. The Black Hawk, 15 ft. 10 in. long; 4 ft. 9 in. beam; 3-bladed screw, 21 in. diameter; boiler 20 in. diameter, 32½ in. high; weight, 300 lbs.; piston, 4½ in.; stroke, 4 in.; 3 horse power; speed of boat, 6 to 7 miles an hour. Perspective and working drawings of this boat and machinery. SUPPLEMENT **14.** Price 10 cents.

The same number contains views of the fast steam yacht Continental. Length, 50 ft., 6½ ft. beam; 3½ ft. depth; two 6 in. cylinders, 6 in. diameter, 8 in. stroke; 7½ horse power; speed, 17·9 miles per hour.

A Thirty-foot Steam Launch.—Approximate cost for boat and machinery complete, $380. Length, 30 ft.; beam, 6½ ft.; depth, 3 ft.; boiler, 3x4 ft.; cylinders, 4 in.; stroke, 6 in.; 3-bladed propeller, 2½ feet diameter. General directions for construction are given. With 5 drawings. SUPPLEMENT **69.** Price 10 cents.

A Forty-foot Steam Launch.—With three-cylinder engine. Drawings to scale, dimensions, and general description. SUPPLEMENT **75.** Price 10 cents.

A Remarkably Fast and Small Steam Launch.—Designed by H. S. Maxim, M.E. Now running in New York Harbor. Length, 21 ft.; weight of boiler, 260 lbs.; engine, 75 lbs.; length of boiler. 26 in.; speed, 10 miles per hour. An elegant boat. With descriptions, dimensions, and drawings to scale. SUPPLEMENT **81.** Price 10 cents.

ACTION OF SCREW PROPELLERS.—By James Howden, Institution of Naval Architects. What has been done, and what remains to do, in increasing the efficiency of the propeller. True direction taken by the streams of water, with 9 illustrations. Centrifugal action on the water impossible. Improved attachment of Blade to Hub, etc. SUPPLEMENT **101.** Price 10 cents.

THE STEAMSHIP ORIENT.—A DEscription, including engravings, of the steamer's compound three cylinder engines, contained in SUPPLEMENT **204.** Price 10 cents.

LIGHT DRAUGHT, FAST, STERN Wheel, steam Yachts. These yachts are 34 feet long, 8 feet 2 inches beam; draught, 16 inches; speed, 7 miles an hour. Designed under direction of Col. F. W. Farquhar, U. S. A., by M. Meigs, U. S. Civil Engineer, U. S. Works, Rock Island, Ill. With working drawings, dimensions, and particulars of vessel, engine, boiler, and wheel, furnished by the author. The serviceable character of these boats, their simplicity of construction, roominess, and light draught render them very desirable, especially for shallow waters. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **179.** Price 10 cents.

FIELD RAILWAY FOR RAPID CONstruction in War. By J. B. Fell. Experiments proving the possibility of Constructing a Railway as rapidly as an Army marches. How Grading is avoided. Freight transported. Cost per mile, and all particulars. In same SUPPLEMENT, descriptions and illustrations of the WESTINGHOUSE BRAKE and the OHIO RIVER VIADUCT. All contained in SUPPLEMENT **55.** Price 10 cents.

UNITED STATES OCEAN COMMERCE in United States Built Ships. An able paper, by W. H. Webb, Esq. Contained in SUPPLEMENT **272.** Price 10 cents.

CUNARD STEAMER GALLIA.—DEscription and Seven Engravings giving a view of the ship, and illustrating her engines and boilers, contained in SUPPLEMENT **202.** Price 10 cents.

H. M. S. INFLEXIBLE.—LARGEST AND Strongest Ironclad Afloat. The Armor and the 80 ton Guns. Dimensions of the vessel, Rig, and Arrangement of Turrets. The Cellular Construction, Ventilating Apparatus, Boilers, Engines, Pumps, Weights, and Cost, with one illustration. Working of the Guns, and Armstrong's Hydraulic System for Turning the Turrets. SUPPLEMENT **122.** Price 10 cents.

STERN-WHEEL STEAM YACHT.—Description and scale drawings in detail of a light draught, fast, Stern-wheel Steam Yacht, designed by U. S. Civil Engineer M. Meigs. Length of hull, 34 ft.; beam at gunwhale, 8 ft. 2 in.; depth of hull, (midships) 24 in.; draught, 16 in.; diameter of wheel, 6 ft.; number of buckets, 12; diameter of boiler, 30 in.; height, 5 ft.; diameter of cylinder, 4½ in.; stroke, 16 in.; draught of boat about 9 in. This is said to be the best type for small steamers of very light draught, being much handier than a side-wheel boat, and easier to construct. SUPPLEMENT, No. **179.** Price 10 cents.

TUNNELS AND ROCK-BORING MAchinery.—By John Darlington. Dimensions, and Methods employed in the Mont Cenis, St. Gothard, Hoosac, Sutro, Musconetcong, and Severn Tunnels, Rapidity of Work, Performances and Cost of Various Machines, Amount of Water, Compressed Air, etc., required, and nine illustrations. The Altenberg Zinc Mines, Aix-la-Chapelle; Perseberg Mines, Sweden; Shaft at Salzberg. Altenwald; Marie Colliery; Pierre Dennis Pit; Stahlberg Musen, Prussia; Gouley Colliery; Dryrook Iron Mines; Sir Frances Level, Yorkshire; Frederichsegen Wrexem Mineral Mines; Johann Colliery, Prussia; Maesteg Tunnel; Cymbran; Dolcoath; South Crofty, Cornwall; Carn Brea, Cornwall; Ballacorkish, Isle of Man. For each Mine or Tunnel is given the number of Holes in Heading. Character of Rock. Labor Employed, Time, Cost, etc. SUPPLEMENT **109.** Price 10 cents.

STEEL ARMOR PLATES.—IMPORTANT Trials of Steel and Compound Steel-and-Iron Plates. Sir Joseph Whitworth's Plates. The Armor of the Inflexible. SUPPLEMENT **112.** Price 10 cents.

STEEL TORPEDO BOATS.—DESCRIPtion and 5 Drawings of Boat 75 ft. long, weighing but 14 Tons. Engines, 250 h. p. Steam Pressure, 120 lbs. The Surface Condenser, Ventilation, the Torpedo Apparatus, and the Screw. Apparatus for Throwing Greek Fire. SUPPLEMENT **116.** Price 10 cents.

THEORY OF STREAM LINES IN RElation to the Resistance of Ships. By William Froude, C.E., F.R.S., President of the Mechanical Section, British Association. With 35 illustrations. A valuable and exhaustive treatise, containing a large amount of practical information concerning the flow of water, its power, the movements of bodies in water, etc. SUPPLEMENTS **3, 4, 5, 6, 8.** Price 10 cents each. 50 cents for the series.

SMALL STEAM TORPEDO BOATS.—BY Mr. Donaldson. Read before the United Service Institution. Engraving and Complete Description of the Steel Propeller "Lightning," 84 ft. long; speed 19 knots per hour. Also, other boats, their Engines and Armament. Their Remarkable Destructiveness proved by Trial. Valuable Experience in War. etc. SUPPLEMENT **79.** Price 10 cents.

WAVE-MAKING RESISTANCE OF Ships. By same author. With 4 illustrations. SUPPLEMENT **74.** Price 10 cents.

WAVE LINES.—BY DR. J. COLLIS Browne. A Description of their Form, and How Ships Ought to be Constructed to Meet them. With an Illustration of Dr. Browne's Improved Yacht Kalafish, with an account of her Remarkable Performances, and thirteen figures. Contained in SUPPLEMENT **135.** Price 10 cents.

WIRE ROPES FOR SHIPS' CABLES.—By G. L. Abegg, A.J.N.A. Their Great Superiority to Chain Cables, in Security, Light Weight, Small Stowage, Facility in Handling, Value when Worn Out, etc., with the advantage that they can be used in Towing, and enable ships to carry an Anchor at the Stern. SUPPLEMENT **132.** Price 10 cents.

SCREW PROPELLERS, THEIR SHAFTS and Fittings.—By Hamilton W. Pendred, M.E. An able treatise, showing the present practice, its advantages and defects. With 25 figures. SUPPLEMENT **4.** Price 10 cents.

ON THE STABILITY OF CERTAIN Merchant Ships.—Short abstract of a paper on this subject read by Mr. W. H. White, before the Institution of Naval Architects; followed by a paper by Mr. Hamilton on "Waves Raised by Paddle Steamers and their Positions Relatively to the Wheels," wherein the author considers two sources of loss of power in steamers: (1) the energy absorbed in creating and maintaining waves; and (2) the effect of this wave formation on wheels. Illustrated with five figures. Contained in SUPPLEMENT **283.** Price 10 cents.

LUNDBORG'S HIGH-SPEED STEAMships.—A design by Capt. Lundborg, of Sweden, for an Atlantic passenger steamer, which, while affording ample space for passengers and valuable cargo, has been prepared with the primary object of attaining a speed of twenty to twenty-one knots an hour with a small expenditure of power. With six figures showing plans, elevations, and sections. Contained in SUPPLEMENT **294.** Price 10 cents.

THE NORDENFELT MITRAILLEUSE.—Detailed description of the mechanism and method of operating the new Nordenfelt-Palmerantz Mitrailleuse—a weapon whose many advantages have brought it recently into great favor with both navy and army officers. Description of the marine type and campaign type. Method of operating. Personnel. Penetration. Ammunition. With two figures of the gun and nine figures (to scale) illustrative of the mechanism. Contained in SUPPLEMENT **294.** Price 10 cents. In the same number may be found a description and illustration of Vavasseur's Improved Naval Gun Carriage and Brake.

THE GREAT STEAMER, CITY OF Rome.—SUPPLEMENT **307.** Price 10 cents.

NEW METHOD OF RAISING SUNKEN Vessels.—By Prof. W. Raydt. SUPPLEMENT **280.** Price 10 cents.

H. M. SHIP POLYPHEMUS.—A NEW Torpedo Ram. With three illustrations. SUPPLEMENT **291.** Price 10 cents.

SHIPBUILDING A THOUSAND YEARS Ago.—SUPPLEMENT **309.** Price 10 cents.

A NEW DIVING SYSTEM.—DESCRIPtion of Fleuss' remarkable apparatus; with three figures. SUPPLEMENT **230.** Price 10 cents.

PROPELLER FOR VELOCIPEDES AND Sleighs. With two cuts. SUPPLEMENT **159.** Price 10 cents.

CARTRIDGE MANUFACTURE.—INTEResting description of the process. SUPPLEMENT **168.** Price 10 cents.

TWIN SCREW STEAM LAUNCH.—ILlustrations in perspective and section, and description of a Screw Steam Launch built for passenger service in shallow waters in the East Indies. Boat propelled by twin screws; dimensions 56 ft. long, 7½ ft. beam, and 3 ft. 9 in. deep; draught 2 ft. 9 in. SUPPLEMENT, No. **171.** Price 10 cents.

STEAM YACHT LADY FRANKLIN.—Illustrations in section of hull and engine of a steam yacht of excellent performance, economical in fuel, length 48 ft., double engine, cylinder 6½ in. diameter and 8 in. stroke; boiler vertical, ⅜ in. iron, diameter 38 in. With two engravings. Contained in SUPPLEMENT. No. **171.** 10 cents.

ON THE MANUFACTURE OF PROJECtiles.—By J. Davidson. Illustrated. SUPPLEMENT **310.** Price 10 cents.

Aeronautics.

ON THE PROGRESS OF AERONAUTICS. —An essay read before the Aeronautical Society of Great Britain by Frederick W. Brearey, Secretary of the Association. A useful and interesting paper. Containing brief accounts of the most recent trials of balloons having mechanical propelling attachments. The required dimensions and best forms for balloons with propelling machinery. Calculations of the power exerted by birds in traveling through the air, and their methods of action. Calculations of the mechanical requisites for successful aerial navigation, as indicated by the flight of birds. Report of balloon trials having vertical screw propellers, made by the British War Office. Air navigation by "pushing" balloons. Experimental trials of the Society's apparatus for testing the Lifting Power of plane surfaces when exposed to wind currents. Description and dimensions of Moys' steam Aerial Locomotive, with an account of its practical trial at the Crystal Palace. Description of Moys' remarkable self-lifting steam engine and boiler, of one horse power, but weighing only thirteen pounds, with dimensions, arrangement of the lifting fans, etc. SUPPLEMENT **50.** Price 10 cents.

NAVIGATION OF THE AIR.—BY FRED. W. Brearey, Hon. Sec. to the Aeronautical Society of Great Britain. A review of what has thus far been accomplished toward a solution of the problem of aerial locomotion; the errors of former experimenters pointed out; and the present and future aspect of the question considered. The direction in which future experiments should be made in order that success may be attained. Contained in SUPPLEMENT **240.** Price 10 cents.

FLIGHT AND ITS IMITATION.—BY Fred W Brearey, Hon. Sec. of the Aeronautical Society of Great Britain. An interesting essay, discussing the present status of the question as to the possibility of aerial locomotion being accomplished by man; pointing out the mechanical conditions of flight which must be thoroughly understood before they are attainable, and explaining the various reasons on which those who are working at the problem found their hopes of ultimate success. Contained in SUPPLEMENT **207.** Price 10 cents.

AERIAL NAVIGATION AND ITS POSsibility.—By T. Choinski. With two figures. SUPPLEMENT **283.** Price 10 cents.

MINING AND METALLURGY.

Mining Engineering, etc.

SURVEYING OF MINING CLAIMS IN Colorado.—By Richard A. Parker, C.E. A paper of interest to young engineers, giving an outline of the method and requirements of claim surveying in the mining regions of the West, and pointing out the inducements that Colorado offers as a field of operations for the civil engineer. Contained in SUPPLEMENT **289.** Price 10 cents.

THE ANTHRACITE COAL FIELDS OF Pennsylvania and their Exhaustion.—By P. W. Sheafer, M.E. A valuable paper read before the Saratoga Meeting of the American Association for the Advancement of Science, describing the geological features which characterize the coal measures of Pennsylvania; giving the statistics of supply and consumption and loss by waste in mining; estimating the period of time which must elapse before our supply of anthracite is exhausted; and comparing our anthracite product and consumption with those of Great Britain. Contained in SUPPLEMENT **241.** Price 10 cents.

BLASTING.—BY ARTHUR KIRK. A valuable paper read before the Engineers' Society of Western Pennsylvania, giving the most improved methods of drilling, the best explosives in use, and the best modes and special directions for firing. Contained in SUPPLEMENT **270.** Price 10 cents.

MINE ACCIDENTS, MECHANICAL APpliances for use in case of Explosions, etc. By Chas. Hawksley and Edward B. Marten. A paper read before the Institution of Mechanical Engineers. Eighteen illustrations of the most approved apparatus for quickly discharging water from mines, promptly restoring Ventilation, etc., namely: the Pulsometer, the Steam Ejector, the Centrifugal, and other Pumps, combined Boiler, Engine, and Air Compressor; Air Lock, and Portable Winding Gear. SUPPLEMENT **105.** Price 10 cents.

THE GREAT COMSTOCK LODE.—BY A. P. Schack, E.M., describing the geology of the region, qualities of ores, method of working; all of a highly interesting character; with many diagrams and sections, showing leads, shafts, and veins. SUPPLEMENT **73.** Price 10 cents.

KIND-CHAUDRON PROCESS FOR SINKingand Tubing Mining Shafts. Read before American Institute of Mining Engineers. By Julien Deby, C.E. A valuable exhibit of the cost, methods, and tools employed, by 21 illustrations. SUPPLEMENT **82.** Price 10 cents.

CALIFORNIAN MINING STAMPS, MORtars, Dry and Wet. Sectional, and Wet Crushing Mortars for Gold and Silver. Cams, Tappets, Sockets, Shoes, Dies, etc. Guides, Screens, and all the apparatus carefully described, with Mode of Work, and Ten Illustrations. SUPPLEMENT **95.** Price 10 cents.

HYDRAULIC MINING IN CALIFORnia.—By August J. Bowie, Jr. Four illus. Construction of Flumes. The Use of Wrought Iron Pipes. Table showing Details of Construction of Wrought Iron Pipe for the Spring Valley Water Company of San Francisco. Profile of Wrought Iron Pipe for the Cherokee Gravel Mines. Two Tables giving Thickness of Iron, Size and Distances of Rivets, and other particulars for various Sizes of Pipe. SUPPLEMENT **106.** Price 10 cents.

THE SUTRO TUNNEL.—BY ADOLPH Sutro. An interesting address, giving the history of this celebrated mining tunnel, from its inception up to the present time, and the reasons that led to the undertaking; describing the methods that have been used in construction, the difficulties that have been encountered, and the obstacles to progress that have been met with; and prefaced by a valuable account of the discovery of the Comstock lode, and of the geological formations of the gold and silver deposits of California. Contained in SUPPLEMENT **205.** Price 10 cents.

ORIGIN AND CLASSIFICATION OF Ore Deposits.—By Prof. J. S. Newberry. A very valuable paper, describing the physical and chemical characteristics of the mineral matters which have proved useful to man. Treating of superficial, stratified, and unstratified ore deposits; the various classes of mineral veins; the theories of vein formation, and the sources of the metallic solutions which have formed deposits of ores. Contained in SUPPLEMENT **223.** Price 10 cents.

MINERS' LINGO.—A COLLECTION OF all the terms used by miners, accompanied by definitions of the same, as given by Mr. M. B. Carpenter in his New Mining Code. Indispensable to all those engaged directly or indirectly in the mining industry, or interested in mining stocks, and who desire to read accounts of mining operations understandingly. SUPPLEMENT, No. **181.** Price 10 cents.

HOW TO EXPLORE FOR MINERALS. —By T. E. Clayton, C.E. A series of valuable rules for prospecting. SUPPLEMENT **200.** Price 10 cents.

Metallurgy.

NOTES ON THE MICROSCOPICAL Examination of Iron.—A Report by A. Martens to the Society of German Engineers. This paper is designed to call the attention of all those interested in iron to the microscopical examination of this metal, and to demonstrate the practicability of this method for determining the comparative value of the different kinds. It shows, by means of enlarged figures, the appearance of carbon or graphite, and how its presence in iron may be demonstrated; the characteristic appearance of fractured Spiegeleisen as seen under the microscope; the pine-tree shaped crystals of the better variety of iron; the appearance of fractured case-hardened iron, of polished Longloan iron, of polished Kenneil iron, and of polished Spiegeleisen etched with sulphate of magnesium; the tabular crystals in fractured Spiegeleisen, and their peculiar figures and lines; the Coniferous Crystals of Krupp Spiegeleisen and the globular elevations attached to them; warts and depressions; the natural figures etched in iron containing manganese; appearance of polished surfaces in Spiegeleisen from Rolandshuette and Wissen, and in Spiegeleisen rich in manganese. The conclusions drawn by the author from the observations here described. This valuable paper shows that microscopical examination is destined to become of the greatest practical value in estimating the value of iron. The entire paper, illustrated with thirty-five engravings, is contained in SUPPLEMENTS **165, 168, 172,** and **174.** Price 10 cents each.

THE PROPERTIES OF IRON AND Steel.—By Daniel Adamson, C.E. Read before the Iron and Steel Institute, with 58 Figures and 2 Diagrams, being one of the most recent and valuable papers ever given to the public. How Testing Machines impose False Conditions. Endurance of Iron and Steel under Concussive Force. Thirty Experiments upon Plates. Annealed Steel. Effects of Sulphur, Phosphorus, and Cinder. Tensile Strength of Iron and Steel. Drilled and Punched Holes. Rule to Find the Power Required to Punch Steel Plates. The Ten-inch Test. Welding of Steel Boiler Plates. A thoroughly Practical and most Valuable Paper, giving Results of Numerous Tests on Bessemer Mild Steel, Best-best Boiler Plate, Martin-Siemens Steel, Crumble Steel, Sub-carbonized Steel, Swedish Bar Iron, Mild Rivet Steel, Best Merchant Iron, Tudhoe Crown Iron, etc., embracing 40 varieties of Iron and Steel. These Tests are illustrated by two full pages of cuts showing the Behavior of the Metal under Torsion, Tension, and Concussion, with the Effects of Punching. The Results embraced in one page of Tables, giving Size of Specimen, Permanent Set Induced, Maximum Strain per cent. of Elongation, Final Breaking Strain, Bending, Drifting before and after Annealing, Composition of Specimen, and all Particulars. Corrosion Tests. Concussion resist d best by Mild Steel. Corrosion of Iron *vs.* Steel by Sea Water. Steel for Ship-building. Best quality for Steel Rails. Best varieties for Gun Barrels. Injury done by Finishing at Black Heat by Hammering. Making Steel Fly Shafts, etc., and other Valuable Practical Conclusions. SUPPLEMENT **150.** Price 10 cents.

BRIEF HISTORY OF BESSEMER STEEL. By Henry Bessemer. An exceedingly interesting sketch of the history of Bessemer steel, from the period of the great invention down to the present time, as given by Mr. Bessemer himself at a meeting of the Iron and Steel Institute, and wherein the celebrated inventor recalls some of the incidents connected with his first presentation of the discovery to the scientific world; such as the incredulity of those to whom he suggested the use of his steel for rails, etc. Concluding with a sketch of the history of the Bessemer steel as applied to ship-building. Illustrated with 6 engravings of the specimens that were exhibited by the author to illustrate his paper. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **183.** Price 10 cents.

HARDENING AND TEMPERING OF Steel. By Joshua Rose. A valuable and excellent paper. What Steel is, and a comparison between Steel and Iron. How to temper to very Pale Yellow, Straw Yellow, Brown Yellow, Light Purple, Dark Purple, Clear and Pale Blue, Greenish Blue. To temper High Grades of Steel. Tempering in Milk and Water. The distinction between Hardening and Tempering. The Expansion and Distortion of Steel. The Weak Points. Decarbonization. Proper kind of Coke, etc. Clear Instructions that will insure success in every operation. SUPPLEMENTS **95, 103, 105.** Price 10 cents each.

IRON AND STEEL.—BY DR. C. W. SIEmens. An interesting and valuable paper, containing accounts of the most recent practical improvements in the Production, Working and Application of Iron and Steel; embracing the question of Labor in its relation to Capital; the Character, Value, Cost, and Production of the various kinds of Fuel, including Bituminous Coals, Coke, American Fuels, Peat, Natural Gas Fuel, Liquid Fuel, Solar Fuel. Motive Powers and their Transmission over long distances. Water Power; its Transmission by Steel Ropes; its Transmission by Electricity. Wind Power. Bessemer Steel History. Siemens and Martin Steel. The Regenerative Furnace. The Open Hearth System. The Use of Ferro-Manganese. Use of Chromium. Production of Mild Steel. Piping of Steel. The Applications of Steel. Iron and Steel Nomenclature. Wrought Iron. Mechanical Puddling. Bell's New Process. Wrought Iron Direct from the Ore. Methods of Protecting Iron and Steel from Rust. Ainslie's Method. Barff's Method. SUPPLEMENTS **70** and **71.** Price 10 cents each.

© 1881 SCIENTIFIC AMERICIAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Metallurgy.

THE SILVER MILL.—BY M. P. BOSS. A valuable Practical Paper, giving descriptions and details of the Best Machinery and Methods now in practice in the United States for the Reduction of Silver Ores. With 7 figures. Particulars of the Quicksilver Pump and Pressure Systems. Best Policy in Milling. Crushing and Grinding; fine vs. coarse Grinding. The Best Crushers in Use. The Most Economic Wear of Stamps. The Amalgamating Pan, the Muller and the Driver, etc. How to Save Time and Labor by Babbitting the Shaft. The Pulp Currents; Angle of Draft for Shoes and Dies; Speed of Pans. The two kinds of Settlers, and their best adaptations. Concentrators and Agitators. "Sand Sluices," and how to Make, Use of Blankets in, and best Grade. Handling of Quicksilver, with Elevations, Plans, and thorough Description of the Pump and Pressure Systems, and their Working in several Mills. Best Retorts, with Dimensions. Pans for Scouring Amalgam, etc. Properties of Quicksilver, Gold, Silver, Copper, Cast Iron, and Lead. Value of Gold and Silver by the ounce, the pound, the cubic foot, and the ton. Useful Formulæ and Tables for estimating Weight of Iron, Copper, etc.; the Tensile Strength of Rods and of Ropes; Pressure of Columns of Water, etc.; Computing ordinary Geometrical Figures; and Recipes for Quick-setting Rust Joint, Cement, Taper for Keys for Shafting, etc. SUPPLEMENT **155.** Price 10 cents.

METALLIC MINERALS.—THEIR PRODUCTION and Uses. A lecture by J. G. Watson, F.R.S. A most interesting paper, containing much information on the principal metals; their ancient and modern uses; metallic veins; what they are, their courses in the earth; mineral leases and royalties; the famous Tavistock Mines; history of the Anglesea Mines; metals dissolved in water; how mineral veins are worked; iron and its uses; lead ores and uses of lead; tin ores and uses of tin; uses of copper. SUPPLEMENT **54.** Price 10 cents.

MANUFACTURE OF BESSEMER STEEL and Steel Rails as pursued at the works of Messrs. Brown, Bayley & Dixon, Sheffield.—By C. B. Holland. A valuable and instructive paper. Read before the Iron and Steel Institute. With Five Illustrations: the Plant; the Cupolas, Converters, the Ingot Pit, Blowing Engines, Hydraulic Machinery, etc. Hot Blast; Mode of Working, Improved Manufacture of Steel Rails. SUPPLEMENT **124.** Price 10 cents.

STEEL—ITS MANUFACTURE AND Working.—Constitution, Qualities, Tempering, etc. With 14 illus. By D. Chernoff. A most interesting and valuable treatise, full of important information, embracing the latest contributions to the general knowledge of the subject. SUPPLEMENT **36** and **37.** Price 10 cents each.

MELTING POINTS OF METALS AND other substances; New Method of Determining.—By Dr. Himly. A Simple and Exact Method. SUPPLEMENT **71.** Price 10 cents.

COMPRESSED STEEL.—BY ALFRED Davis. An interesting paper descriptive of the arrangements adopted at the Barrow (England) works for compressing fluid steel by the direct application of high-pressure steam, in order to avoid the unsoundness which accompanies steel castings as made by the Bessemer and Siemens-Martin process. Contained in SUPPLEMENT **247.** Price 10 cents.

WHY DOES STEEL HARDEN?—BY William Metcalf, C.E. An interesting paper showing what has thus far been done in the way of gathering facts preparatory to an attempt to determine what are the chemical or physical changes that occur in the phenomena of hardening, tempering, and annealing of steel. Full details of the experiments made by the author and others during the last five years, and statements of the results obtained. Contained in SUPPLEMENTS **223** and **224.** Price 10 cents each.

THE TREATMENT OF IRON TO PREVENT CORROSION.—By Prof. Barff. An interesting paper detailing the theory and practice of oxidizing the surface of iron by means of superheated steam to prevent rusting. The author's method, which is herein described is justly considered one of the most valuable discoveries of the age. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **174** and **175.** To be had at this office, and of all newsdealers. Price 10 cents each, or 20 cents for the two.

IRON AND STEEL.—AN INAUGURAL address delivered before the Iron and Steel Institute by Edward Williams concerning steel in bulk for railway requirements and other constructive works. The subject is treated under the following headings: The Initial Processes; the Bessemer Discovery; Puddling; Improved Working; Steel and its uses; is Remelting necessary? The New Steel-making Process; Steel-making Economies; the Future of Iron; Iron-making Furnaces; American and other Foreign Competitions; Wasteful Ingot-making; Better Rolling Machinery; Scientific Training Needed; Unqualified Managers; Future prospects of Steel and Iron. Followed by a paper read at the same meeting by Geo. J. Snelus, on "The Removal of Phosphorus and Sulphur During the Bessemer and Siemens-Martin Processes of Steel Manufacture." Contained in SUPPLEMENT **181.** Price 10 cents.

PRESERVATION OF IRON AND STEEL. —Full description of the processes devised by Messrs. Barff and Bower respectively, in recent years, for the preservation of iron and steel against rust through the application of a coating of magnetic oxide. With ten figures, showing elevation and sections of the Barff furnace, and transverse, longitudinal, and horizontal sections of the Bower furnace. Contained in SUPPLEMENT **287.** Price 10 cents.

ALUMINUM. — ITS CHARACTER, Weight, Industrial Uses, Alloys, Method of Manufacture, and Cost in Market. A valuable paper. SUPPLEMENT **35.** Price 10 cents.

THE INFLUENCE OF SURFACE CONdition on the Strength of Steel.—A paper describing the results of a series of experiments recently undertaken in England to ascertain the strength of steel under variable surface conditions. With three tables giving results of the tests, and twenty figures showing the nature of the fractures. Contained in SUPPLEMENT **302.** Price 10 cents.

HOW MONEY IS MADE.—BY A. E. Outerbridge, Jr. A descriptive article, initiating the reader into some of the delicate and little known means by which the noble metals are coined into money at the United States Mint; showing how the base metals are refined out of the bullion; how miscellaneous assortments of gold are analyzed or assayed; how the metal is refined; the mechanical processes it next undergoes; and finally how the operation of coinage is performed. Contained in SUPPLEMENT **182.** Price 10 cents.

THE TREATMENT OF IRON TO PREvent Corrosion.—By Prof. Barff. An interesting paper detailing the theory and practice of oxidizing the surface of iron by means of superheated steam to prevent rusting The author's method, which is herein described, is justly considered one of the most valuable discoveries of the age. Contained in SUPPLEMENTS **174** and **175.** Price 10 cents each, or 20 cents for the two.

SPENCE'S METAL—A NEW METALLIC Compound.—By Granville Cole, Ph.D. A full description of the valuable new Metallic Compound recently discovered by Mr. J. Berger Spence, and known as "Spence's Metal." 1. Discovery of the Metal. 2. Its Chemical Composition. 3. Its Properties. 4. Its Manifold Uses to Art. 5. Its Various Industrial Uses. 6. Miscellaneous Applications. 7. Discussion of the foregoing paper by the Members of the Society of Arts. Contained in SUPPLEMENT **222.** Price 10 cents.

HARDENING, TEMPERING, AND ANnealing of Steel.—A series of reports made to the Research Committee of the Institution of Mechanical Engineers: 1. Nature and Composition of Steel and Cast Iron. 2. Quantity of Carbon in Steel and Cast Iron, and its State. 3. Substances other than Carbon entering into the Composition of Steel. 4. Hardening of Steel. 5. The Molecular Changes that occur in Hardening, Tempering, and Annealing. 6. Directions in which Further Investigations appear to be Needed. Appendix. Contained in SUPPLEMENTS **221** and **222.** Price 10 cents each.

THE ALLOYS OF MANGANESE.—A review of the past history and present state of the manufacture of "Crude Manganese," with a description of some of the newer alloys of the metal with copper, tin, and zinc, and their characteristics and applications. Contained in SUPPLEMENT **293.** Price 10 cents.

BLAST FURNACE SLAG.—AN INTEResting paper descriptive of the many new and important uses of the hitherto waste material known as Furnace Slag, and the methods of its preparation, including Slag Shingle, Slag Sand, Slag Bricks, Slag Stone, Slag Mortar and Cement, Slag Wool, Slag Glass, Slag Railway Sleepers, Slag Paving Blocks, etc. SUPPLEMENT **199.** Price 10 cents.

EXPERIMENTS ON ALLOYS OF SILver with Embrittling Metals—By Alexander E. Onterbridge, Jr. Being a series of Experiments Conducted at the United States Mint, Philadelphia, on the Effects of Silver Alloyed with Arsenic, with Antimony, with Bismuth, with Lead. Interesting particulars of the results of each experiment. SUPPLEMENT **185.** Price 10 cents.

THE INOXIDATION OF IRON AND the Coating of Metals and other Surfaces with Platinum.—By L. M. Stoffel, C.E. A description of the processes of M. Dodé for the inoxidation of iron, the enameling of metals, and the platinum coating of metals. In these processes (to the application of which there is scarcely any limit in the industrial world) heat is substituted for galvanism, the use of acid is entirely dispensed with, and there is thus no cause to encourage oxidation. Compared with electroplating and galvanizing, Dodé's processes, by reason of their moderate cost and facility of application, present such advantageous features that a large field for operation is thereby opened SUPPLEMENT, No. **177.** Price 10 cents.

ALLOYS OF MANGANESE.—SUPPLEMENT **293.** Price 10 cents.

TREATMENT OF FLUID BLAST-FURnace Slag.—By A. D. Elbers. SUPPLEMENT **300.** Price 10 cents.

RUSSIAN SHEET IRON, MANUFACture of.—By H. B. Froom. SUPPLEMENT **301.** Price 10 cents.

LEAD PROCESSES. — RECENT IMprovements in.—By Norman C. Cookson. SUPPLEMENT **299.** Price 10 cents.

LEAD—HOW TO COAT ARTICLES Therewith. SUPPLEMENT **265.** Price 10 cents.

RECENT PROGRESS IN THE MANUfacture and Applications of Steel.—By Prof. A. K. Huntington. SUPPLEMENT **298.** Price 10 cents.

INFLUENCE OF SURFACE CONDITION on the strength of Steel.—Illustrated. SUPPLEMENT **302.** Price 10 cents.

APPARATUS FOR CASTING METALS in annular form. with four figures, SUPPLEMENT **299.** Price 10 cents.

SOME RECENT IMPROVEMENTS IN Lead Processes.—By N. C. Cookson. SUPPLEMENT **299.** Price 10 cents.

IMPROVEMENTS IN THE TREATMENT of Blast Furnace Slag.—By A. D. Elbers. SUPPLEMENT **300.** Price 10 cents.

THE MANUFACTURE OF RUSSIAN Sheet Iron.—By H. B. Froom. SUPPLEMENT **301.** Price 10 cents.

IRON AND STEEL UNDER THE HAY Process.—By A. T. Hay. SUPPLEMENT **282.** Price 10 cents.

NEW METAL ACTINIUM.—BY DR. T. L. Phipson, F.C.S., etc. SUPPLEMENT **305.** Price 10 cents.

REMOVAL OF NOXIOUS VAPORS FROM Roasting Furnace Gases.—SUPPLEMENT **299.** Price 10 cents.

ZINC BATH FOR GALVANIZING IRON —With three cuts. SUPPLEMENT **161.** Price 10 cents.

COMPARATIVE WEAR OF IRON AND Steel Rails.—SUPPLEMENT **157.** Price 10 cents.

HOW MONEY IS MADE.—BY A. E. Outerbridge, jr. Interesting account of the processes employed at the United States Mint. SUPPLEMENT **182.** Price 10 cents.

THE PREPARATION OF PURE PLATinum and Iridium, and Notes on the Manufacture of Iridio-Platinum. By George Matthey. SUPPLEMENT **194.** Price 10 cents.

THE GALVANIZING PROCESS.—FACTS of interest concerning zincked iron and the process of galvanizing. SUPPLEMENT **176.** Price 10 cents.

COATING IRON WITH COPPER.—NEW French Process. SUPPLEMENT **213.** Price 10 cents.

NEW PROCESS FOR GILDING METAL Surfaces.—By P. A. Dodé. SUPPLEMENT **222.** Price 10 cents.

NEW METHOD FOR THE SEPARATION of Nickel and Cobalt.—By Ph. Dirvell SUPPLEMENT **211.** Price 10 cents.

TO HARDEN THIN STEEL ARTICLES. —SUPPLEMENT **206.** Price 10 cents.

NEUTRALIZATION OF PHOSPHORUS in Steel.—By Richard Brown. New process of neutralizing the phosphorus in steel so as to obtain castings which are free from small cavities. SUPPLEMENT **202.** Price 10 cents.

NEW PROCESS FOR PRODUCING Malleable Nickel of Different Degrees of Hardness.—By J. Garnier. SUPPLEMENT **260.** Price 10 cents.

SIEMENS-MARTIN STEEL.—BY SERgius Kern, M.E. Method of manufacture. Hard steel. Medium steel. Soft steel. SUPPLEMENT **239.** Price 10 cents.

MECHANICS AND MECHANICAL INTERESTS.

Mechanical Trades, Processes, Etc.

TEMPORARY BRIDGES. — DESCRIPtion of a type of temporary bridges, which require for their construction nothing more than such undressed woods as may be found almost anywhere, and which may be put together and taken apart again in a few hours. Useful on farms, and in gardens and parks, and also of great utility in military operations. Illustrated with two cuts, showing model of bridge with details of structure, and improved mode of tying joints. Contained in SUPPLEMENT **239.** Price 10 cents.

PRINCIPLES OF HORSE SHOEING.—By Geo. Fleming, V.S.—A paper describing the proper method of shoeing horses so that the animal's feet may be kept always healthy and sound. How much the walls of the hoof should be reduced and how the operation should be performed; the kind of shoes that should be selected; how they should be fitted; the number and size of nails that should be used, and how the face of the hoof should be treated. Followed by a description of a modified form of the "Charlier" method as successfully followed by the author for many years. Contained in SUPPLEMENT **205.** Price 10 cents.

HINTS TO YOUNG MACHINE-TENDers.—By an old Papermaker. Practical instructions for the tending and caring of Papermaking Machinery. Showing how to clean a Dandy; how to make good edges; to keep paper from crushing and worming; to stop crimping; together with many other valuable directions, hints, and suggestions. SUPPLEMENT **79.** Price 10 cents.

THE GRANULATION OF WHEAT.—BY Oscar Oexle, C.E. Treatment of Middlings. Practice in Austria, France, Italy, Spain, and other countries; Practice in High and Flat Grinding, Grading, Sizing, Purifying, etc. SUPPLEMENT **98.** Price 10 cents.

HYDROSTATIC JOINT FOR GAS AND Water Mains.—A Lead Joint Calked by Hydrostatic Pressure. A Durable Tight Joint, Economically and Easily Made and Repaired, which will Yield to Deflection without Leakage. Two figures. SUPPLEMENT **109.** Price 10 cents.

HORSE-SHOEING.—By D. E. SALMAN, D. V. M. In this paper, which is of great practical interest to every horse owner and horse-shoer, the author shows that horse-shoeing, as it has been hitherto practiced in this country, is responsible for a large proportion of the lamenesses with which our horses have been afflicted; and he points out, by a study of the physiology of the horse's foot, how shoeing should be properly performed and what errors should be avoided in the operation. SUPPLEMENT, No. **174.** Price 10 cents.

SOLDERING.—AN EXCELLENT PRACtical treatise for home and shop use. By G. M. Hopkins. With eight illustrations. SUPPLEMENT **20.** Price 10 cents.

HOW TO DO IT AND HOW NOT TO DO It. A series of sixteen engravings, being sketches from life, showing the Right and the Wrong Positions of working in executing various labors, such as Fine and Rough Chipping, Rough Filing, Draw Filing, Scraping, Boring, Grinding, Pattern Sawing, etc., etc. With many excellent practical hints. How to execute True Work, etc. SUPPLEMENT **88.** Price 10 cents.

CUTTING OUT KEYWAYS. BY JOSHUA Rose. An excellent practical description of the several methods employed, with eleven illustrations. The qualities of the various drills; square files and safe-edges, roughing out, etc. The best tools described and illustrated. SUPPLEMENT **79.** Price 10 cents.

SILVERING GLASS.—THE LATEST AND Best Method of Silvering Mirrors and other articles of Glass by Chapman's, Siemens', Petitjean's, Draper's, and Lavat's Processes. SUPPLEMENT **105** Price 10 cents.

COMPLETE PREVENTION OF BOILER Incrustation.—Instructions given by the chemical factory of Eisenbuettel for removing generators of incrustation from the feed-water of steam boilers. Arrangement for purifying boiler water with lime and carbonate of soda. The purification of the water. Examination of water purified by means of lime and carbonate of soda. Results of this mode of water purification. Contained in SUPPLEMENT **286.** Price 10 cents.

NEW PROCESS MILLING.—ITS ECONomy and General Adoption. Principle of the Process. Its Parallels in the Hungarian Process, and the Monture Economique of France. SUPPLEMENT **111.** Price 10 cents.

COACH PAINTING.—A PRACTICAL paper, full of valuable hints on the subject of painting and decoration. How to prepare the paint foundation for the coach body. How to mix and apply the colors. Floated or false tints. Method of painting the running parts. The decorative art. Harmony of colors. Contained in SUPPLEMENT **262.** Price 10 cents.

OIL MILL.—ILLUSTRATED. SUPPLEMENT **293.** Price 10 cents.

APPARATUS FOR REPAIRING LOCOmotives.—With two cuts. SUPPLEMENT **281.** Price 10 cents.

FRACTION OF LOCOMOTIVES.—RULE for calculating. SUPPLEMENT **287.** Price 10 cents.

RIVETING. — ILLUSTATED. SUPPLEMENT **296.** Price 10 cents.

Machinery and Mechanical Appliances.

NEW HAND-LEVELS. ABNEY'S LEVEL for Prospecting, Computing Amount of Grading in Laying Out House Sites, Terraces, Drives, etc. Bohne's Automatic Level Description and Cost of each, with four figures. SUPPLEMENT **133.** Price 10 cents.

CUTTING TOOLS FOR LATHES AND Planers.—By Joshua Rose. With nine figures. A valuable paper full of practical information. SUPPLEMENT **38.** Price 10 cents.

HOW TO MAKE RUBBER HAND Stamps.—Practical directions. SUPPLEMENT **83.** Price 10 cents.

SURFACE PLATES OR PLANOMETERS, and Scraped Surfaces. A valuable treatise for mechanics who desire to execute truthful work. By Joshua Rose. With seven engravings. SUPPLEMENT **15.** 10 cents.

MACHINES AND TOOLS FOR WORKING Metal, Wood, and Stone, at the Centennial Exhibition.—By John Anderson. Machines and Tools of the American Watch Company, Ames & Co., Pratt & Whitney, the Putnam Company, Brown & Sharp, Mr. Corliss, W. Sellers & Co., and others. The Corliss Bevel Gear Cutter; Sellers & Co.'s Steam Hammer; A New Machine for Making Plane Surfaces; Lathes; Planing Machines; Special Tools; an Automatic Gear Cutter; a Marked Change in Heavy Shearing Machines; Smithing and Forging. SUPPLEMENT **114.** Price 10 cents.

NEW FORM OF TOOTHED GEARING. By Prof. C. W. MacCord. Elliptical Bevel Wheels. An Interesting Mathematical Application and Entertaining Mechanical Study. With Five Figures and Directions for Draughting. SUPPLEMENT **141.** Price 10 cents.

HOW TO ADJUST LINE SHAFTING.—By Joshua Rose. A valuable, practical paper, illustrated with 8 figures, showing how, by a very simple plan, shafting may be accurately lined. SUPPLEMENT, No. **190.** Price 10 cents.

MILLING MACHINES AND MILLING Tools.—An excellent practical treatise. By Joshua Rose. Seven engravings. SUPPLEMENT **16.** Price 10 cents.

STONE-SAWING MACHINERY. — A valuable and interesting paper, read before the Society of Engineers, with twenty illustrations. SUPPLEMENT **54.** Price 10 cents.

VELOCIPEDE CARRIAGES OF LIGHT Construction.—Fast speed. Worked by hand cranks, also by foot treadles. SUPPLEMENT **8.** Price 10 cents.

WHEELBARROWS AT PARIS EXHIBItion of 1878. Wheelbarrows for carboys, baggage, railroad stations, gardens; excavating, dumping, and tub barrows; wood trucks, sack trucks, stone trucks, pig-iron trucks, bloom-trucks; almost every conceivable form of wheelbarrow and hand truck. Shown in SUPPLEMENT **165.** Twenty-five engravings. Price 10 cents.

PLACING CRANKS ON SHAFTS AT Right Angles.—By Joshua Rose. With seven engravings. A valuable paper. SUPPLEMENT **23.** Price 10 cents.

STENOGRAPHIC REPORTING MAchine.—A description of M. Michela's stenographic reporting machine, which has attracted great attention in Europe, and been practically and successfully tested by the French Chamber of Deputies and Senate, and the Italian Parliament. An apparatus which inscribes by syllables, instead of letter by letter as done by former writing machines. With five engravings. Contained in SUPPLEMENT **278.** Price 10 cents.

SIMPLE SINGLE-ACTING STEAM ENgine.—By G. M. Hopkins. Description, with six illustrations, showing details of construction of a simple steam engine, the different parts of which may be turned on a very ordinary foot-lathe by the amateur mechanic. The engine is single acting, of about 1-20 h.p., and is very effective, being of sufficient size to run, with suitable steam supply, a foot-lathe, scroll-saw, or two or three sewing machines. The cost of materials for its manufacture should not exceed five dollars. Contained in SUPPLEMENT **279.** Price 10 cents.

FLEUSS' DIVING APPARATUS.—BY B. W. Richardson. An interesting lecture delivered before the Society of Arts, in which is reviewed the history of diving, and the attempts that have been made by men of science to live under water: with a description of Fleuss' new diving dress, which enables the wearer to stay for hours under water, with an account of some of the remarkable experiments that have been performed with it. Illustrated with two figures. Contained in SUPPLEMENT **242.** Price 10 cents.

HOW TO USE THE CARPENTER'S Square.—By John O'Connell, Millwright. Over 40 engravings. An excellent Practical Treatise on the many Mathematical and Geometrical uses of the common Square, and explaining the manner of using the various scales marked thereon. Also, directions how to find a circle equal in area to two given circles; to lay off an octagon in a square; to find the center of a circle with a square, and many additional problems. Also, the application of the Square to Roofing, Stair Building, etc. A valuable and useful paper. SUPPLEMENTS **88, 89.** Price 10 cents each; 20 cents for the two.

ENGLISH BICYCLES: SPEED TWENTY miles per hour; 200 miles made in one day. Weight, 40 or 50 lbs. 8 illustrations. SUPPLEMENT **73.** Price 10 cents.

HOW TO MAKE SPIRAL SPRINGS.—By Joshua Rose. With three engravings of the tools, which are easily made, and complete practical directions for working, including hardening and tempering. SUPPLEMENT **20.** Price 10 cents.

LOCOMOTIVE CONNECTING AND Parallel or Coupling Rods. By Joshua Rose. With 10 illustrations. A practical and useful paper. SUPPLEMENT **31.** 10 cents.

ELLIPTICAL GEARING.—BY PROF. C. W. MacCord, of the Stevens Institute of Technology. With eight engravings. A most clear and excellent exposition of the subject. SUPPLEMENT **2.** Price 10 cents.

FILES *VS.* EMERY WHEELS AND MILLing Tools.—By Joshua Rose. Excellent practical suggestions on proper use of the Emery Wheel Milling Tools.—By Joshua Rose. Excellent practical suggestions on proper use of the Emery Wheel, Milling Tools, Buff Wheel, Files, etc., and Grades and Character of work to which each should be applied. Best Methods for Hard Metal Work, Saw Filing, Roughing Down, Trimming of Castings, Cylindrical Work, etc. SUPPLEMENT **63.** Price 10 cents.

DIFFERENTIAL WHEELS OF NEW Form. By Prof. C. W. MacCord. The Action of Epicyclic Trains Explained, with five figures. Contained in SUPPLEMENT **134.** Price 10 cents.

ROCK DRILLS WORKED BY COMpressed Air.—By H. W. Pendred, C.E. Description of the most recent and best practice. SUPPLEMENT **20.** Price 10 cents.

HOW TO SET A SLIDE VALVE.—BY Joshua Rose. Seven engravings. The best practical treatise on the subject, giving in condensed form simple and plain directions, which will enable any person to Set Slide Valves quickly and correctly. SUPPLEMENT **13.** Price 10 cents.

© 1881 SCIENTIFIC AMERICIAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Machinery and Mechanical Appliances.

FITTING KEYS AND KEYWAYS.—BY Joshua Rose SUPPLEMENT **56.** Price 10 cents.

SKEW-BEVEL WHEELS.—BY PROF. C. A. MacCord. The subject of laying out the teeth of Skew-bevel wheels has been made, by the manner in which it has been hitherto treated, to seem more complicated than it really is. By a careful study of this article, wherein the author treats in a plain and practical manner of "Pitch-Surfaces and how to Draw Them, Tooth-Surfaces and how to Construct them, and Special and Singular Relations of Pitch-Surfaces." Any ordinarily expert draughtsman will be enabled to construct the wheels and their teeth in a manner which will satisfy all the requirements of practice. The principles involved in the mode of operation here described are demonstrably correct throughout, and the degree of accuracy attainable in the results will depend wholly on the care and skill of the manipulator. Illustrated with 27 explanatory figures, and contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **174, 176,** and **178.** Price 10 cents each.

BAVILLE'S TOOL HOLDERS. — TOOL Holder for Lathe. Simple Tool Holder for Planing Machine. Double Tool Holder for Planing Machine. Shaping Machine Head. Simple Tool Holder, with Vertical Cutter, for Slotting Machine. Double Tool Holder, with Horizontal Cutters, for Slotting Machine. With 22 figures. SUPPLEMENT **147.** Price 10 cents.

LOCOMOTIVE INJECTORS, WITH ENgraving. SUPPLEMENT **42.** The same number contains sectional elevation of locomotive for Dom Pedro Railway, with table of dimensions. 10 cents.

MACHINE FOR DOTTING TULLES AND other Light Fabrics.—Illustrated. SUPPLEMENT **303.** Price 10 cents.

WOOD PULP.—APPARATUS FOR MAKing. SUPPLEMENT **299.** Price 10 cents.

AMERICAN MILLING METHODS.—BY Albert Hoppin. SUPPLEMENT **303.** Price 10 cents.

CENTRIFUGAL APPARATUS FOR Casting Metals.—Illustrated. SUPPLEMENT **299.** Price 10 cents.

APPARATUS FOR THE MANUFACture of Wood-pulp.—With two figures. SUPPLEMENT **299.** Price 10 cents.

EXPLOSION OF APPARATUS FOR PREventing Fire Damp.—Illustrated. SUPPLEMENT **305.** Price 10 cents.

CORRUGATED BOILER FLUES.—SUPPLEMENT **293.** Price 10 cents.

A NEW EXPANSIBLE PULLEY.—ILLUStrated. SUPPLEMENT **308.** Price 10 cents.

LIMITING THE NUMBER OF TEETH of Spur Wheels.—By Prof. C. W. MacCord. SUPPLEMENT **306.** Price 10 cents.

House Warming, Plumbing, Etc.

HEATING BY HOT WATER—A VALUable practical article.—By a Hot Water Engineer, fully explaining the natural principles which must be understood and kept in view by all engineers who wish to achieve success in this method of warming buildings; showing how to calculate and properly arrange the piping, and how to construct the supply cistern; describing the best form of boilers, how they should be made, and what they should be made of and how they should be set; and giving recipes for the best kinds of cements to be used in this department of engineering. Illustrated with 3 diagrams. SUPPLEMENT, No. **171.** Price 10 cents.

HOT AND COLD WATER PLUMBING.—SUPPLEMENT **160.** Price 10 cents.

THE HEATING POWER OF COAL GAS. —By Dr. William Wallace, Coal Examiner of Glasgow. SUPPLEMENT **216.** Price 10 cents.

IMPROVED GAS BURNERS. — WITH eight cuts. SUPPLEMENT **249.** Price 10 cents.

Boat Making, Rigging, Etc.

HOW TO BUILD BOATS CHEAPLY.—A series of plain, practical articles, showing how any intelligent person, by following the directions, may build a boat with economy. Each article is accompanied by drawings, diagrams, directions, dimensions, etc.

The Three-Dollar Scow.—Directions for construction, seven illustrations. SUPPLEMENT **25.** Price 10 cents.

The Five-Dollar Rowing Skiff.—With full directions for construction. Thirteen illustrations. SUPPLEMENT **26.** Price 10 cents.

The Fourteen-Dollar Sailing Skiff.—With fourteen illustrations. Full directions for construction of boat, center board, rudder, mast, sail, etc. SUPPLEMENT **29.** Price 10 cents.

The Twelve-Dollar Row Boat.—Twenty-five illustrations. Illustrates the construction of a graceful ribbed boat, light weight. Shows the method of securing good lines, how to bend and arrange the ribs, dimensions of all the parts, and directions for construction in full. SUPPLEMENTS **30, 32.** Price 10 cents each—20 cents for the two.

The Sixteen-Dollar Family Boat.—With seven illustrations. Tables of measures and full directions for construction. A handsome and commodious boat. SUPPLEMENT **36.** Price 10 cents.

The Fifteen-Dollar Whitehall Row Boat.—With three illustrations. Tables of measures and full directions for construction. SUPPLEMENT **37.** Price 10 cents. This number also contains fourteen excellent practical rules for the management of sail boats, by an experienced sailor.

The Fifteen-Dollar Sailing and Rowing Canoe.—With eight illustrations, including perspective of double sale rig. Tables of dimensions and directions in full for construction. SUPPLEMENT **39.** Price 10 cents.

A Thirty-Dollar Yacht.—With eight illustrations, including perspective of sail rig. Tables of dimensions and full directions for construction. SUPPLEMENT **42.** Price 10 cents.

A Three-Hundred-Dollar Center-board Yacht.—With ten illustrations, dimensions, and directions for construction. A fast and serviceable vessel. SUPPLEMENT **67.** Price 10 cents. The entire series of 10 numbers, relating to boat building, sent for $1.

The series embraces about 100 illustrations.

THE LIFE BOAT CANOE EVANGEList. A sailing canoe for Sea Cruising, with one illustration. SUPPLEMENT **112.** Price 10 cents.

A NOVEL BOAT RIG.—BY H. R. TAYlor. Practical directions for rigging a small sailing craft in such a way that the sails are under the complete control of the helmsman, being quickly lowered in case of danger, and as quickly raised again, with a single hand, while the other is upon the tiller. By the aid of the author's description and the accompanying detail figures any one can fit his boat up with this peculiar rig and thereafter avoid all the danger that accompanies sailing in small vessels rigged in the ordinary style. Illustrated with 8 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **163.** Price 10 cents.

BOATS' RIGS.—NINE VARIETIES OF Rigs in Actual Use, for Yawls and Open Boats and Yachts. The Handiest Rigs for Cruising. The English Style. Nine figures. Also, Description with Dimensions and Four Drawings to Scale of a SMALL BOAT FOR ROUGH WATER, with Construction and Mode of Rigging. SUPPLEMENT **131.** Price 10 cents.

HOW TO BUILD CATAMARANS, OR Double-hull Sailboats.—Combining simplicity of construction, safety, and high speed. Full directions for construction, dimensions, and illustrations of three sizes of these boats, costing from about $50 to $500. Also, interesting description of Mr. Herreshoff's Patent Catamarans. Speed 20 miles per hour. SUPPLEMENTS **105, 106.** Price 10 cents each.

FOLDING OR COLLAPSIBLE BOATS for Ships.—By Rev. E. L. Berthon, M.A. Read before Society of Arts. With three engravings, showing construction, with full description. SUPPLEMENT **84.** Price 10 cents.

A LIGHT PADDLING CANOE, AND How to Build it.—By Chas. E. Chase. The author is a well known expert in canoe building and sailing. He here gives a description, accompanied by a full set of working plans drawn to a scale, of an easily constructed and inexpensive paddling canoe, which may be built by any intelligent person. Unpainted, this little craft will weigh no more than twenty-five pounds. She is designed for speed under a double-bladed, jointed eight-foot paddle, and carries no sail. She affords no sleeping accommodations, but will carry a light camping outfit. She is the craft for small streams and frequent portages, and will run through rapids where the heavier canoes will capsize. This is a most valuable, practical paper. Contained in SUPPLEMENT **219.** Price 10 cents.

CATAMARAN, OR DOUBLE-HULLED Sailboat, with Malay Rig, in use in San Francisco Harbor. Directions for Constructing a Cheap, Simple and Handy Boat, with four figures. SUPPLEMENT **117.** Price 10 cents.

SHARPIE MODEL SAIL BOAT.—BY E. A. Van and F. W. Tuttle. Working plans and description of a sail boat after the "Sharpie" model —a form of boat which for speed and seagoing qualities has no equal. With the aid of the drawings and directions here given almost any one with a few tools, and at small expense, can build a really good sail boat or steam yacht on this plan, giving much more room for machinery and crew than the more costly "Carver" or "Clinker" built boats of like dimensions. SUPPLEMENT, No. **177.** Price 10 cents.

NEW CAT-RIG. BY CAPT. R. B. FORBES. A Simple, Handy Sail that can be Reefed from the Standing-room in less than One Minute. Adapted to Cat, Sloop, and Schooner Rigs. Two figures. SUPPLEMENT **133.** Price 10 cents.

VELOCITY OF ICE BOATS.—A COLLECtion of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with ten explanatory diagrams. Contained in SUPPLEMENT **214.** Price 10 cents.

SAILBOAT WITH ROLLER CENTERboard and Hinged Mast, three figures. Contained in SUPPLEMENT **134.** Price 10 cents.

ICE-BOAT WHIFF.—FULL WORKING drawings and description, with dimensions of the model ice-yacht Whiff, the fastest yacht in the world. Exhibited at the Centennial, by Irving Grinnell. With 14 illustrations. SUPPLEMENT **63.** Price 10 cents.

SMALL STEAM YACHT.—BY M. A. Beck. Plan and elevation of a small steam yacht, with detail drawings showing arrangements of machinery. Length of vessel, 21 feet beam, 5 feet; depth of hold, 26 inches; boiler, 20 inches diameter, 40 inches high; piston, 4 inch stroke; 3-blade propeller, 24 inches diameter. Contained in SUPPLEMENT **166.** Price 10 cents.

FISHING BOATS AT THE BERLIN International Fisheries Exhibition.—Illustrations and explanations of nine characteristic specimens of fishing boats, selected from among the numerous models exhibited at the Exhibition at Berlin. Drontheim Fishing Boat. English Fishing Boat. Fishing Cutter constructed in Blankenese. Norwegian Pilot Boat. Herring Boat constructed in Emden. Tilting Net Boat of Cousland. Ocean Fishing Boat constructed in Stralsund. Shadow Canoe. Fishing Boats of Netherland-India. Full page illustration. Contained in SUPPLEMENT **241.** Price 10 cents

ICE-BOATS — THEIR CONSTRUCTION and management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, M.E. SUPPLEMENT **1.** The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

THE CONSTRUCTION OF CANVAS Canoes.—By W. P. Stephens. Complete descriptions and working drawings of two handsome and durable boats, designed for the benefit of those who do not care to go to the expense of a wooden canoe, and who prefer to build and equip their own craft. The larger boat in model is similar to the famous Baltic Rob Roy, but is an improvement upon that. Dimensions: length, 14 ft.; beam, 26 in.; depth at bow, 12½ in.; stern, 12 in.; amidship, 9 in.; draught, loaded, 5 in. The smaller boat is well suited for a boy, and will do for hunting, fishing, and cruising. It is very portable. Length, 12½ ft.; beam, 26 in.; depth, 12, 11½, and 8½ inches. By means of the detailed directions and drawings here given, any one with slight mechanical ingenuity can construct for himself a boat, which, with proper care in use, will prove very durable. Contained in SUPPLEMENT **216.** Price 10 cents.

DOUBLE BOATS.—TWENTY-ONE ILlustrations of patented double boats, the general construction and plan of which are so clearly shown as to need no detailed description. Name of patentee and date of patent accompanying each diagram. Contained in SUPPLEMENT **232.** Price 10 cents.

DELAWARE RIVER GUNNING SKIFF. —Detailed description, accompanied by figures drawn to a scale, showing the mode of construction of a "duck boat" or "gunning skiff," which cannot fail to recommend itself to sportsmen. These boats are 12 to 15 feet long, the smaller being best for two persons, while the larger makes an excellent rowboat for hunting, fishing, and pleasure. Owing to their light weight and flat bottom they may be pushed over the mud where there is not enough water to float them, or may be easily dragged over grasses or sedges at portages without injury. Contained in SUPPLEMENT **207.** Price 10 cents.

CATAMARAN SAIL BOAT.—BY T. M. Prentiss. Description in detail, accompanied by perspective view, of a new and improved catamaran pleasure boat built on Cayuga Lake. Length of hulls over all, 17 ft.; deck, 15 ft.; mast 21 ft.; dimensions of sails, 28½ square yards. The boat is so stable that capsizing seems impossible, and gibing is one of her most innocent performances. No ballast required. Weight, 1,500 pounds; draught, 6 inches. Contained in SUPPLEMENT **225.** Price 10 cents. The same number contains illustrated description of a novel catamaran passenger steamboat lately built on the Hudson.

THE CRUISING CANOE "JERSEY Blue." By W. P. Stephens, Commodore of the Jersey Blue Canoe Club. Full description, with engravings, of the best form as yet devised of a canoe for general cruising purposes. The boat here described was built after several cruises in a Rob Roy and "American Model" Nautilus, and the changes that have been made from the established form are such as the large experience of the builder has shown to be needed. By the aid of the minute instructions here given, and the accompanying 8 figures, which are drawn to a scale, this craft may be easily constructed. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **164.** Price 10 cents.

BOAT LINES. HOW TO GET THEM.— By R. Gooper. Practical Directions, both for Designing and Building, with 11 figures. SUPPLEMENT **140.** Price 10 cents.

KNOTS AND SPLICES.—A COMPLETE and extensive paper on splicing, tying, and fastening ropes for ship's rigging, for lifting tackle, and many other purposes. Illustrated by ninety-four engravings, showing knots, splices, hitches, slings, etc., so clearly as to enable any one to make them easily without reference to the text. The engraving shows the turn, double turn, tapered end (two kinds), eye splice, tie for four strand rope, shells, deadeyes, interlacing in two directions, pigtail, scull pigtail, lark's nest, slip clinch, ordinary knot, wedding knot, bowline knot, waterman's knot, Portuguese knot, short splice, pudding splice, long splice, belaying-pin splice, shroud, marlin spike, belaying-pin, variable lashing, fair leader, round turn, round button, square mooring, crossed fastening, double chain fastening, necklace tie, knot for binding timbers, half hitch, timber hitch, clove hitch, hammock hitch, cask sling, bale sling, butt sling on end, and a large number of other knots, splices, and hitches. SUPPLEMENT **319.** Price 10 cents.

Amateur Mechanics and Home Decorations.

HOW TO MAKE A TELESCOPE.—BY George M. Hopkins Directions, accompanied by a complete set of working drawings, whereby any person may easily construct for himself at small cost, an effective telescope, capable of giving its possessor a great deal of enjoyment and knowledge of astronomy. Illustrated with seven figures of details, drawn to a scale. Contained in SUPPLEMENT **252.** Price 10 cents.

HOW TO MAKE AN INDUCTION COIL. —By George M. Hopkins. Practical Instructions, accompanied by four figures, three of which are drawn to a scale and may be used as working drawings By means of the complete and minute directions and the figures here given, any one can construct for himself a simple, cheap, and very efficient Induction Coil, capable of charging a Leyden jar, decomposing water, exploding blasting cartridges, lighting gas, exhibiting the phenomena of electric light in vacuo, as well as of being used in performing very many interesting experiments. Contained in SUPPLEMENT **160.** Price 10 cents.

HOME-MADE TELESCOPE STANDS.— By T. D. Simonton. A valuable paper, descriptive of a simple, effective, and economical method of constructing an equatorial telescope stand. With three illustrations to scale. SUPPLEMENT **78.** Price 10 cents.

HOUSEHOLD ORNAMENTS.—BY GEO. M. Hopkins. A paper containing directions for the easy manufacture of a great variety of beautiful objects for the adornment of the parlor and the home, of wood, but finished in imitation of bronze ware, including vases, urns, medallions, card receivers, brackets, match safes, picture frames, and hundreds of other articles. With 6 illustrations. SUPPLEMENT **7.** Price 10 cents.

A HOME-MADE HORSE POWER.—BY William R. Brooks. Shows how any farmer, without the aid of a carpenter, may construct for himself with little trouble and but slight expense, a horse power machine capable of shelling corn, cutting feed, sawing wood, cleaning grain, pumping water, churning, and performing numerous other operations on the farm. Minute directions, illustrated with two engravings. SUPPLEMENT, No. **190.** Price 10 cents.

CHEAP HOUSEHOLD ORNAMENTS.— By Geo. M. Hopkins. Practical Directions, with 13 illustrations, for making numerous Ornamental Objects with the simplest Tools and Materials. SUPPLEMENT **112.** Price 10 cents.

HOW TO MAKE A PHONOGRAPH. Full Instructions, with Eight Working Drawings, Half Size. Construction easy and Inexpensive. Contained in SUPPLEMENT **133.** Price 10 cents,

CHEAP HOUSEHOLD ORNAMENTS.— By Geo. M. Hopkins. Practical Directions, with 13 illustrations, for making numerous Ornamental Objects with the simplest Tools and Materials. SUPPLEMENT **112.** Price 10 cents.

AMATEUR MECHANICS.—A TREATISE on tools and appliances for amateur mechanics, including a cheap and easily made lathe, Drills and drilling Tempering. Drill chucks. Work supports. Different modes of centering. Different ways of steadying work. Chucks and chucking. Turning and boring tools. Easily made slide rest. Rotary cutters, saws, and milling tools. Metal shaping. Wood working attachments for the foot lathe. Chasing screws. Knurl and knurling Spinning metals with examples of work and tools Lens making; full description of tools and methods for small lenses. Glass engraving. Work in burnished brass. Tools and methods completely illustrated by a large number of engravings. SUPPLEMENTS **311, 312, 313, 317, 318.** Price 10 cents each.

DOVETAIL AND DOVETAILING Tools.—With seven cuts. SUPPLEMENT **195** Price 10 cents.

BROMIDE OF COPPER—ITS PECULIarities and economical preparation. SUPPLEMENT **162.** Price 10 cents.

TECHNOLOGY.

Receipts and Processes.

CLEANSING TISSUES WITH MINERAL Oils.—By M. Zaengerle. Practical Directions for Cleansing White Silk, White Woolen Articles, Velvets, etc., Pure Wool Garments, and Woolen Articles of Deep Colors and Mixed Tissues These useful instructions, with Practical Papers on Argol Substitute, Fixing Indigo on Tissues, etc SUPPLEMENT **82.** Price 10 cents.

CEMENTS. VALUABLE RECEIPTS FOR a great variety of cements, applicable to all of the purposes of the Household and Shop, including Rubber Cement, Waterproof, Acid-proof, Fireproof, Aquarium, Hydraulic, and Battery Cements. Cement for paper boats, for metals, for china and glassware, for leather, rubber, and for cementing leather and rubber to metals, glass, etc. Cements for wood, stone, etc. SUPPLEMENT **158.** Price 10 cents.

CONFECTIONERY AT HOME. — BY Catherine Owen. Plain and practical directions for making a number of fine French candies; the only apparatus needed to obtain perfect results being a brass saucepan and a silver spoon and fork. This valuable collection embraces recipes for making Fondants, Panache Fondants, Chocolate Creams, Orange and Lemon Creams, and Roman Punch Drops. SUPPLEMENT **199.** Price 10 cents.

DYEING RECIPES. — YELLOW CANnelle, Carmelite Olive, Tete de Negre, Dark Cannelle, Gold Yellow on Linen, Chrome Orange on Linen, Rose on Linen, Claret on Cotton Yarns, Fast Black on Woolen Yarn, Billiard Green on Cloth. Frothing of Colors. Dyeing, Printing, and Bleaching. New Sizing Method. Chinese Silk Production. SUPPLEMENT **53.** Price 10 cents.

HOW TO REMOVE STAINS AND SPOTS from Linen, Cotton, Woolens, and Silk. Being a Table of Specific Directions, showing how to proceed in removing from each of the above kinds of goods any stains of the following character, to wit: Stains of Sugar, Glue, Blood, Albumen, Grease, Varnish, Oil, Paints, Stearine, Vegetable Colors, Red Wine, Fruit Stains, Red Ink, Alizarine Ink, Iron Rust, Ink made with Galls, Lime, Lye, Alkali Stains, Tannin, Green Nut Stains, Coal Tar Stains, Wagon Grease, Acid Stains, etc. By means of this valuable table of directions any person, by providing himself with a few simple chemicals, and using them as directed, may readily clean any species of the above goods, and if necessary set up a cleaning shop. This is one of the most convenient and valuable papers on the subject ever published. Contained in SUPPLEMENT **158.** Price 10 cents.

100 CHOICE PRACTICAL RECEIPTS pertaining to matters of the Household, including various branches of Cookery. Invaluable to Housekeepers. Contained in SUPPLEMENT **164.** Price 10 cents.

MISCELLANEOUS USEFUL RECIPES. A collection of about 40 valuable recipes for the Household, Workshop, and Laboratory. How to make Skeleton Leaves. How to Preserve Autumn Leaves. How to make Smooth and Rough Academy Boards. Fumigating Paper. Recipes for Soluble Blue, Paste for Scrap Books, Babbitt Metal, and Fusible Metal. Phosphorescent Paint for Clock Dials, etc. How to make Gelatine Moulds for Plaster Casts. How to Weld Horn. Recipes for Staining Horn Different Colors. Walnut Stain. How to Render Cloth Fireproof and Water roof. Moth and Roach Exterminator. To Color Butter. To Remove Stains from Marble. To Remove Mustiness from Casks. How to Make Sticky Fly Paper. Chemical Novelties. Recipe for Ivorite or Artificial Ivory. Artificial Fuel. New Colors. Colors from Cocoa. Method of Preparing the Dyestuff "Morine." A new Mineral Gum, a Substitute for Gum Arabic. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **159.** The same number contains a valuable recipe for making a Superior Gum, and Directions for Keeping Fruit. Price 10 cents.

SKELETON LEAVES AND CRYSTALlized Grasses.—Full directions for easily and quickly making these pleasing preparations for household adornment. Contained in SUPPLEMENT **270.** Price 10 cents.

MISCELLANEOUS RECEIPTS.—INcluding Moth and Roach Exterminator. Waterproofing Cloth. Making Cloth Fireproof. Fumigating Paper. Coloring Butter. Phosphorescent Clock Dials. Academy Board, to Make. Staining and Welding Horn. Stains, to remove from Marble. Skeleton Leaves, to Make. Walnut Stain. Soluble Blue. To Relieve Casks of Mustiness. Fusible Metals. Babbitt Metal, etc. In SUPPLEMENT **159.** Price 10 cents.

SIZING OF COTTON GOODS.—READ before the Society of Arts, by W. Thompson, F.R.S. A most Full and Clear Description of the Process, embracing: An account of the process of Weaving, explaining the object and utility of Size. A table of Sizing Mixtures, in which are enumerated the Substances used: 1, for giving Adhesive properties of Size; 2, to give Weight and Body to the Yarn; 3, for Softening Size or Yarn; and 4, for Preserving the Size from Mildew and Decomposition. Tests for these Substances, and Directions for Preparing, so as to obtain the results required. Proportions of Sizing. Use of Flour in Size. Weighting Materials, China Clay, and its substitutes. "Softenings," and Oils for Softening. East Winds and their effect. Glycerine, Grape Sugar, Mildew Preventives, and Tape Sizing. "Slashing," Packing, Damaged Goods, etc. SUPPLEMENT **80.** Price 10 cents.

PRESERVATION OF WOOD, WITH Special Regard to the Beerizing Process.—By Sigismund Beer. A detailed account, by the inventor, of his process for seasoning wood so as to make it undecayable and to render it more compact, of greater strength and bearing power, and of a finer appearance, as well as vermin proof. Contained in SUPPLEMENT **272.** Price 10 cents.

HOME MADE FURNITURE; OR, WHAT may be done with a few sticks.—Beautiful furniture from ordinary materials. Two examples of fire screen. Book rack. Card stand. Stand or pedestal for statuary, placques, etc. All easily made and truly ornamental and useful. Five engravings. A most useful and valuable paper. SUPPLEMENT **318.** Price 10 cents.

USEFUL ITEMS FOR MILLERS.— SUPPLEMENT **234.** Price 10 cents.

FORMULÆ FOR ANILINE INKS.— SUPPLEMENT **230.** Price 10 cents.

DYEING RECIPES. — SUPPLEMENT **231.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Receipts and Processes.

SUMMER BEVERAGES.— A COLLECtion of over forty choice and valuable recipes for making various delicious summer beverages for domestic or restaurant use. The list embraces formulas for making Lemonade, Orangeade, Currant Water, Raspberry Water, Cherry Water, Soda Negus, Raspberry, Vinegar, Champagne a la Minute, Ice Tea or Coffee, Orgeat Beverage, Holland Beverage, Imitation Arrack Punch, Spanish Beverage, Persian Beverage, German Beverage, Claret Beverage, Narranada, English Rumfustian, Winter or Summer, West India Tipples, Imperial Beverage, Milk Punch, Brandy Punch, Regent's Punch, Claret Punch, Prince Regent's Punch, Bishop, Heidelberg Bishop, Princes' Punch, Cocoanut Beverage, Turkish Beverage, Ice Coffee Beverage, Claret Beverage, Sherry Beverage, Gin Punch, Sherry Cobbler, Mint Julep, Mead or Honey Wine, West India Shrub. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. **192.** Price 10 cents.

STIMULATING DRINKS.—AN INTEResting account of the various liquids that are used in different parts of the world as stimulants. The Egyptian Kooshaf. Tiste. Ginger Tea. Mongol Wine. The Drink of the Ft. Rupert Indians. Labrador Tea. Falkland Island Tea. Parched Meal and Water. Orange Wine. Wine from Rice. Newfoundland Beer. Wild Rice Tea. Walnut Tree Wine. Fern Leaf Tea. Brick Tea. Topakibi Wine. Aquare Wine. Quass. Guarana. Paraguay Tea. Honey Wine. Soua. Cider and Perry. Kerkedan Coffee. Beer of the Basutos. Chinese Wine. Contained in SUPPLEMENT **236.** Price 10 cents.

HOW TO SOFTEN HARD WATER.—Description of Dr. Clarke's simple process for softening hard waters, and at the same time purifying the water. This paper is of much value and interest. Contained in SUPPLEMENT **270.** Price 10 cents.

ROMAN CANDLES.—PLAIN AND easily understood directions for making Roman Candles; describing the tools and materials that are employed, and giving in minute detail the process of manufacture. How to make a 5-8th Roman Candle; Roman Candle Stars; Damp Stars; Lac Solution; Wax Solution; Stearine Solution; Dextrine Solution; Paste; Roman Candle Scoops; How to Charge the Candles; How to Make the Touch Paper; and how to make Slow Matches and Quick Matches. Illustrated with fifteen figures. Contained in SUPPLEMENT **209.** Price 10 cents.

FRUIT SIRUPS.—BY ADOLPH G. Vogeler, Ph.G. A paper of much value, giving practical directions in detail for making various fruit sirups, such as raspberry, strawberry, mulberry, and cherry, and showing how natural fruit sirups may be distinguished from a spurious article. Contained in SUPPLEMENT **293.** Price 10 cents.

EFFERVESCENT BEVERAGES. — RECipes for making certain delicious beverages for summer use, including: Ginger Beer, Lemon Beer, Hop Beer, and Spruce Beer. Contained in SUPPLEMENT **270.** Price 10 cents.

INKS.—A COLLECTION OF UPWARDS of 50 valuable recipes for making Inks of all kinds and for every purpose. The list embraces: Writing Inks, such as Black Ink, Aniline Black Ink, Asiatic Black Ink; Arnold's Writing Fluid, Green Ink, Blue Ink, Red and Carmine Inks, White Ink; Indelible Inks for marking linen and other textile fabrics; Drawing and Illuminating Inks, such as Gold Ink, Silver Ink, Carbon Ink, India Ink, Drawing Ink; Marking Inks for marking packages of merchandise; Sympathetic Inks of all kinds and colors; Japan Ink; Ink Powders; Hausmann's Indestructible Ink; Close's Indestructible Ink; Shoemaker's Ink; Stencil Inks; Papyrograph Ink; Inks for writing on Zinc; Inks for writing on Silver; Ink Erasers. In these recipes, which have all been gathered from standard authorities, the materials given for making the inks are inexpensive and easily obtainable; the directions are free from technicalities and the manipulations are simple. This collection is invaluable. SUPPLEMENT, No. **157.** Price 10 cents.

USEFUL RECIPES FOR THE CONFECtioner, the Baker, and the Cook.—By J. W. Parkinson. Cream Cake, Doughnuts, Crumpets, Biscuit, Kisses. Apples a la Turque. Mead. Glair of Eggs. Ratafia de Framboises, Ratafia de Cerises, Raspberry and Currant Paste. To Color Sugar Sand. Cheese Cake. Cocoanut Macaroons. Orange Slices. Ice Cream, Fruit Ices, Iced Souffle. Lady Fingers, White Bride Cake, Sugar for Crystal Work. Scolloped Clams. To Restore the Fragance of Oil of Lemons. Family Bread. Contained in SUPPLEMENT **136.** Price 10 cents.

MISCELLANEOUS RECEIPTS.—INcluding Moth and Roach Exterminator. Waterproofing Cloth. Making Cloth Fireproof. Fumigating Paper. Coloring Butter. Phosphorescent Clock Dials. Academy Board, to Make. Staining and Welding Horn. Stains, to remove from Marble. Skeleton Leaves, to Make. Walnut Stain. Soluble Blue. To Relieve Casks of Mustiness. Fusible Metals. Babbitt Metal, etc. In SUPPLEMENT **159.** Price 10 cents.

FIFTY SIRUP RECIPES FOR HOUSEhold purposes, Mineral Waters, etc., to wit: Simple Sirup, (2) Lemon Sirup, Mulberry Sirup, Vanilla Sirup, Vanilla Cream Sirup, (2) Cream Sirup, Ginger Sirup, Orange Sirup, (2) Pineapple Sirup, Nectar Sirup, Sherbet Sirup, Grape Sirup, Banana Sirup, (2) Coffee Sirup, Wild Cherry Sirup, Wintergreen Sirup, (2) Sarsaparilla Sirup, Maple Sirup, (2) Chocolate Sirup, Coffee Cream Sirup, Ambrosia Sirup, Hock and Claret Sirup, Solferino Sirup, Capsicum Sirup, Cherry Sirup, Strawberry Sirup, (2) Raspberry Sirup, Peach Sirup, Blackberry Sirup, Orgeat Sirup, Catawba Sirup, Milk Punch Sirup, Champagne Sirup, Sherry Cobbler Sirup, Excelsior Sirup, Fancy Sirup, Currant Sirup, Framboise Sirup, Maidenhair Sirup, Orange Flower Sirup, Cinnamon Sirup. How to make Sirups Frothy.

Colognes for the Sick Room, by Geo. Leis. With recipes for the production of preparations that serve as pleasing perfumes, deodorizers, and cosmetic lotions. SUPPLEMENT **77.** Price 10 cents.

PRACTICAL DYEING RECIPES.—A collection of practical formulas which have all been verified as perfectly reliable, and which are warranted to come out satisfactorily if the proportions are adhered to, and the manipulations be workmanlike. Recipes for Blue or White Zephyr; Scotch Blue on Worsted—one Bath; Scotch Green on Worsted—one Bath; Jacquineaux on Worsted; Drab on Worsted—one Bath; Gold on Venetian Carpet Yarn—one Bath; Red Brown Slubbing; Scarlet Braid—One Bath; Slate Braid—one Bath; Light Drab on Cotton; Blue on Cotton; Brown on Cotton; Chrome Orange on Cotton Carpet Yarn: Black on Common Mixed Carpet Yarn for Filling; Black on Cotton and Wool Mixed Yarn. SUPPLEMENT, No. **169.** Price 10 cents.

JELLIES, JAMS, AND PRESERVES.—A valuable collection of approved recipes for making the following articles: Apple Jelly, Crab Apple Jelly, Quince Jelly, Raspberry Jelly, White Currant Jelly, Peach Jelly, Red Currant Jelly, Cherry Jelly, Gooseberry Jelly, Peach Marmalade, Raspberry Marmalade, Blackberry Marmalade, Quince Marmalade, Quince Cheese, Rhubarb and Orange Marmalade, Strawberry Marmalade and Jam. How to preserve Quinces, Apples, Crab Apples, Muskmelon, Cherries, Orange Peel, Lemon Peel, and Pine Apples. SUPPLEMENT. No. **196.** Price 10 cts.

ARTIFICIAL FRUIT ESSENCES—FORmulæ for making the following fruit essences for the use of Confectioners, Soda Water Vendors, etc. Essence of Apple, Pear, Cherry, Black Cherry, Peach, Apricot, Plums, Grape, Currant, Straw, berry, Raspberry, Pineapple, Melon, Orange, Lemon-Blackberry, and Nectarine. SUPPLEMENT, No. **196.** Price 10 cents.

SILK DYEING, RECIPES FOR.—BY M. De Vinant. SUPPLEMENT **266.** Price 10 cents.

A NATURAL WOOD PRESERVATIVE.—By H. H. Nicholson. SUPPLEMENT **308.** Price 10 cents.

PARAFFIN TO PRESERVE EGGS.—SUPPLEMENT **308.** Price 10 cents.

NATURAL WOOD PRESERVERS.—SUPPLEMENT **308.** Price 10 cents.

PLANT LABELS: HOW TO MAKE.—By Rev. C. Wolley, Dod. SUPPLEMENT **279.** Price 10 cents.

ADULTERATION OF OLIVE OIL, AN Easy Test for.—By M. Conroy, F.C.S. SUPPLEMENT **287.** Price 10 cents.

COPYING INK WITHOUT A PRESS.—SUPPLEMENT **304.** Price 10 cents.

PRESERVING AND CANNING, HINTS on.—SUPPLEMENT **305.** Price 10 cents.

FORMULA FOR A PRESERVATIVE OF Organic Substances.—By H. Strure and O. Jacobsen. SUPPLEMENT **292.** Price 10 cents.

FRUIT SIRUPS. — FOURTEEN RECeipts. SUPPLEMENT **293.** Price 10 cents.

COFFEE.—SUPPLEMENT 308. PRICE 10 cents.

PRESERVING AND CANNING.—SUPPLEMENT **305.** Price 10 cents.

SILK.—HOW IT IS SPUN FROM THE Cocoon. SUPPLEMENT **309.** Price 10 cents

GLYCERINE CEMENT.—RECIPE FOR. SUPPLEMENT **163.** Price 10 cents.

VALUABLE RECEIPTS.—QUICK PROcess for making vinegar. How to bleach gutta percha. How to etch on glass. How to prepare battery carbons. How to make fine court plaster. Glaze for pottery. How to make oxygen. SUPPLEMENT **313.** Price 10 cents.

HOW TO MAKE A SUPERIOR GUM.—By Dr. G. Thenius. SUPPLEMENT **159.** Price 10 cents.

FIRE PROOF PAPER AND INK FOR Documents.—SUPPLEMENT **158.** Price 10 cents.

SHOEMAKER'S WAX.—HOW TO MAKE. SUPPLEMENT **169.** Price 10 cents.

ARTIFICIAL CARLSBAD SALTS.—Recipe for. SUPPLEMENT **165.** Price 10 cents.

COLORED PENCILS FOR WRITING ON Glass, Metal, etc.—Recipes for making. SUPPLEMENT **185.** Price 10 cents.

DYEING RECIPES.—SUPPLEMENT 182. Price 10 cents.

SULPHATE OF INDIGO.—FRENCH method of preparing. By M. Van Laer. SUPPLEMENT **173.** Price 10 cents.

BLACKS FOR GARMENT DYEING.—Valuable recipes for. SUPPLEMENT **228.** Price 10 cents.

CEMENT WHICH RESISTS ACIDS.—Recipe for. SUPPLEMENT **216.** Price 10 cents.

HOW TO INLAY PEARL IN IRON.—SUPPLEMENT **224.** Price 10 cents.

VARNISHES FOR PROTECTING IRON.—By W. Foster. SUPPLEMENT **226.** Price 10 cents.

PRINTING RECEIPTS.—FORMULÆ for Amber "Steam;" Dark "Steam" Brown; "Steam" Green; and "Steam" Purple. SUPPLEMENT **208.** Price 10 cents.

TO DYE WOOD BLACK.—SUPPLEMENT **207.** Price 10 cents.

FRUIT SIRUPS.—METHODS OF PREparation. By A. G. Vogeler. SUPPLEMENT **256.** Price 10 cents.

DETECTION OF INKS.—BY W. THOMson, F.R.S.E. List of reagents for testing inks in cases of supposed fradulent writing and method of employing them. SUPPLEMENT **255.** Price 10 cents.

BLACK PAPER PULP.—BY AUGUSTE Abadie. Recipes for producing nine shades from greenish blue to deep blue black. SUPPLEMENT **249.** Price 10 cents.

LUMINOUS PAINT.—HOW TO MAKE. SUPPLEMENT **249.** Price 10 cents.

INCOMBUSTIBLE TISSUES.—RECIPES for mixtures to give a fire-proof finish to curtains, ball dresses, and other fabrics. SUPPLEMENT **245.** Price 10 cents.

NON-POISONOUS COLORS FOR CONfectionery, etc.—SUPPLEMENT **239.** Price 10 cents.

ON SILK DYEING. — BY MARIUS Moyret. SUPPLEMENT **181.** Price 10 cents.

CRYSTALS: A GUIDE TO A KNOWledge of the subject of Crystallography.—SUPPLEMENT **176.** Price 10 cents.

PORCELAIN PRINTING. — PREPARAtion of colors for.—By V. Joclet. SUPPLEMENTS **170** and **182.** Price 10 cents each,

MULTIPLICATION SIMPLIFIED.—BY T. M. Bofill.—A valuable set of rules, and a table for rapidly finding all the products possible between factors containing figures of equal value. SUPPLEMENT **227.** Price 10 cents.

THE CARTOMETER. — DESCRIPTION and figure of a useful apparatus for measuring distances on plans and maps. SUPPLEMENT **212.** Price 10 cents.

PEARL INLAYING.—A PRACTICAL treatise on inlaying mother-of-pearl. Full description of tools, methods, and materials. SUPPLEMENT **317.** Price 10 cents.

DISTILLATION OF COAL TAR.—THE Scotch system. With two figures. SUPPLEMENT **172.** Price 10 cents.

HOW CALENDER ROLLERS ARE Ground. With six cuts. SUPPLEMENT **174.** Price 10 cents.

HOW TO BRONZE PLASTER OF PARIS Casts. SUPPLEMENT **169.** Price 10 cents.

TO TAN LACE LEATHER WITH SOFT Soap.—SUPPLEMENT **169.** Price 10 cents.

WATERPROOF SOLES.—HOW TO make. SUPPLEMENT **164.** Price 10 cents.

LUBRICANTS. — A COMPREHENSIVE and valuable paper, giving the composition of leading and well-known lubricants for machinery, engines, etc. SUPPLEMENT **316.** Price 10 cents.

BUTTER COLORING. — HARMLESS methods of giving butter a "rich golden color." SUPPLEMENT **316.** Price 10 cents.

WATERPROOFING CLOTH. — SEVEN processes for waterproofing cloth. Full and complete directions. SUPPLEMENT **317.** Price 10 cents.

HOW TO PAINT ON WOOD IN WATER Colors.—SUPPLEMENT **213.** Price 10 cents.

CEMENT FOR GLASS, EARTHEN AND Wedgwood Ware.—SUPPLEMENT **213.** Price 10 cents.

LECLERC'S PROCESS FOR SILVERING Glass.—SUPPLEMENT **224.** Price 10 cents.

Patents, Insurance, Etc.

THE FIRE ENGINEER, THE ARCHItect, and the Underwriter.—By Edward Atkinson. An address delivered before the Convention of the Fire Engineers of the United States, at Boston, pointing out the manifold defects in much of the architecture of the present day, from the standpoint of liability to combustion, and giving the author's views as to the proper method of constructing buildings that shall be fireproof. Treats of: Shams in Architecture. Notable examples of false methods of construction. How buildings are often set on fire by rats and spontaneous combustion. Methods of reducing fire risks. How to make a nearly fireproof building with ordinary materials. Fires caused by steam pipes. Spontaneous combustion. Contained in SUPPLEMENT **250.** Price 10 cents.

THE NEW GERMAN PATENT LAW.—Being the Full Text of the New Law for Patents, passed July 1st, 1877, covering all the States of the German Empire. Contained in SUPPLEMENT **80.** Price 10 cents.

THE POLICY OF PATENT LAWS.—BY Frederic H. Betts. An able paper read before the Social Science Association at Saratoga Springs, 1879, in which the author, after reviewing the history and nature of Patents, the objections that have been made to Patent Laws, and the alleged annoyances from them; and after showing the beneficial effects of Patents on prices, the benefits of Laws on the subject, and how Patents promote trade, urges that the teachings of experience pronounce that the Policy which has created, upheld, and liberalized Patent laws is just and sound, and ought not to be abandoned. Complete in Supplement, No. **197.** 10 cents.

EXPLOSION AS AN UNKNOWN FIRE Hazard.—SUPPLEMENT **288.** Price 10 cents.

INVALIDITY OF STATE LAWS CONcerning the Sale of Patents.—All laws of State Legislatures that in any manner interfere with the free sale of Patent rights, such as the requiring of the agent or patentee to file copies of patent, take licenses, procure certificates, comply with forms, or which release the payee of ordinary notes of hand given for patents, have been declared unconstitutional and void by the United States Courts. All State judges, sheriffs or other State officials who undertake to interfere with patentees or their agents in the free sale of patents, make themselves liable to damages and other punishment. Decisions of the United States Courts on these points. SUPPLEMENT **25.** Price 10 cents.

EXTINGUISHING FIRE IN TAR DIStilleries.—By Watson Smith, F.C.S. SUPPLEMENT **181.** Price 10 cents.

HOW TO GET LARGE STREAMS FOR Fire extinction.—With diagrams showing prper and improper position of hydrant. SUPPLEMENT **256.** Price 10 cents.

Special Manufactures.

THE MANUFACTURE OF GRAPE SUgar and Glucose.—By O. Luthy. Conversion, Neutralization, and Evaporation and Purification of the Liquor, Manufacture of Glucose by means of Malt. The Apparatus, Chemicals, and Practical Instructions for these Processes. SUPPLEMENT **96.** Price 10 cents.

JAPANESE LACQUER. — ITS MANUfacture and application. With 19 illustrations. SUPPLEMENT **43.** Price 10 cents.

MANUFACTURE OF ARTIFICIAL BUTter. -By Prof. Henry A. Mott, Jr., E.M. With six engravings. Being a History of the Artificial Butter Manufacture, Descriptions of the Principal Processes now in use, Details of Latest Improvements, Plan of an Artificial Butter Factory, Engravings of the Machinery required, Chemical Analyses of Butter and of Artificial Butter, Details of the Cost of setting up an Artificial Butter Factory, the Capital required, the materials and quantities consumed, Cost of Manufacture per pound, the Daily Profit, etc. A complete and reliable treatise. SUPPLEMENTS **48, 49.** Price 10 cents each.

THE MANUFACTURE OF WROUGHT Iron Pipe.—Choice of Iron. Rolling. Bending the Sheets; Welding the Tube; Polishing and Smoothing the Pipe; Manufacture of Gas Pipe, with four figures. Contained in SUPPLEMENT **136.** Price 10 cents.

GLUCOSE.—A COLLECTION OF VALuable technical papers on the manufacture of this important commercial product. The American manufacture of corn glucose. The conversions—Starch, Dextrine, Complete Glucose. Depreciation of a glucose factory. Fire risks of glucose factories and manufactures. Glucose factory ignitions and fires. The Hirsh improved process of manufacturing sugar from corn. Wolff's improved process. Furbish s process of glucose manufacture. Pigeon's improved process of manufacturing the same. Full details of each method. Illustrated with two cuts. Contained in SUPPLEMENTS **259** and **260.** Price 10 cents each.

THE TECHNOLOGY OF THE PAPER Trade.—By William Arnot, F.R.S. Its Early History. Invention of the Beating Engine, Introduction of Soda, etc., and the First Machine-made Paper. Cameron's Machine; the Fourdrinier Machine. Interesting sketch of the Old Time Paper Mill vs. the Mill of Modern Times, the latter described at length, with all the Apparatus; the Sorting, Boiling, Breaking, Poaching, and Beating Processes; Progress of the Pulp through the Machine; the Draining, the Rolls, the Cooling Rolls, the Sizebath. Raw Fibrous Materials, their Characteristics and Treatment Preparatory to Pulping. Cotton, Straw, Linen, Hemp, Esparto, Wood. Instructive Account of the Numerous Chemical and Boiling Processes, etc. This treatise gives Practical Particulars in every Department of Papermaking, Describing the Latest and Best Processes and Machines in use, with Statistics, Profit, etc. SUPPLEMENTS **109, 110, 116, 117, 118, 123.** Price 10 cents each.

BUTTER AND BUTTER MAKING.—A paper of great interest to dairymen, embracing the substance of addresses made by Messrs. Sturtevant, Bowditch, and others at a meeting of the Franklin County, Mass., Institute, on the most approved methods of making butter. The proper food for milch-cows. The characteristics of good milk. The proper temperature of the cream. Best methods of churning and working the butter. Matters that affect the quality of the butter. Proper method of judging of quality of butter. Contained in SUPPLEMENT **282.** Price 10 cents.

OIL PRESSING MACHINERY.— AN account of methods employed in crushing oil from seeds; with a description of improved machinery for the purpose. Illustrated with twelve figures, showing plans and sections of an oil mill in England, and the various apparatus used therein. Contained in SUPPLEMENT **293.** Price 10 cents.

SUGAR MAKING.—AN ACCOUNT OF the experiments of Prof. Peter Collier, of the Department of Agriculture, in manufacturing sugar from sorghum cane—a plant sufficiently hardy for culture throughout the country; showing the practicability of making this one of the best paying crops in the country, and predicting that five years hence the United States will be producing all its own sugar. Contained in SUPPLEMENT **214.** Price 10 cents.

THE MANUFACTURE OF JUTE.—BY William Fleming. A valuable and interesting technical paper, giving in brief the origin and history of the jute industry, and a complete description of the mode of manufacture of the crude material into yarn. The process of softening. The breaker card. The finisher card. Drawing frame. Roving frame. Spinning frame. Contained in SUPPLEMENT **247.** Price 10 cents.

FELT HATS: HOW MADE, AND DISeases Suffered by the Workmen.—By L. Dennis, M.D. A full abstract of an elaborate paper presented to the Board of Health of New Jersey, and, as far as known, the only one that has ever been written on this subject. To make clear the dangers to which operatives in this business are exposed, a description of each process in the manufacture of hats is given; common felt hats being the kind studied. The various kinds of Furs that are used for Felt Hats; how the Fur is "Carroted" with Mercury; The Effect of the Mercury on the Fur; Effects of the Dust on the Human System; Formation of the Hat Body; Diseases of the Hat Body Men; The Operations of Stiffening, Rolling, and Pressing; Dyeing and Coloring the Hat; Pouncing the Hats; Finishing; Diseases of the Finishers; Interesting Facts and Suggestions. Contained in SUPPLEMENT **191.** Price 10 cents.

ON THE MANUFACTURE OF Matches.—By John A. Garver, A.B. An exceedingly interesting paper. The Chemistry of the Match; Dangers of their Manufacture and use; Wax, Safety, and numerous curious varieties. Commercial Statistics. SUPPLEMENT **84.** Price 10 cents.

PAPER PULP FROM WOOD.—HOW prepared. SUPPLEMENT **293.** Price 10 cents.

HUGUENIN'S FULLING MACHINE.—Illustrated. SUPPLEMENT **305.** Price 10 cents.

APPARATUS FOR MANUFACTURING Celluloid.—With one figure. SUPPLEMENT **265.** Price 10 cents.

PROGRESS OF THE FUR TRADE.—An interesting account of the rise and present status of this industry. SUPPLEMENT **280.** Price 10 cents.

GLASS MANUFACTURE OF, FOR DECOrative Purposes.—By J. H. Powell. Illustrated. SUPPLEMENT **295.** Price 10 cents.

NEW POINTS IN THE PRODUCTION of Milk.—SUPPLEMENT **264.** Price 10 cents.

LOGWOOD.—A LECTURE BY PROF. George Jarmain, showing the nature and extensive uses of this valuable dyeing material; the methods of its preparation; the chemical conditions of its coloring principles: the various colors it is capable of producing, together with the latest and best recipes for the practical use of the dye, embracing: common black at one operation; common doeskin black; doeskin black for wool; chrome black with blue reflection for wool; wooded blacks; lavender on wool; cudbear; archil and archil paste; logwood blue for wool; red woods; claret brown on wool; madder; brown on wool; how to test the value of dye woods. SUPPLEMENT **54.** Price 10 cents.

TOBACCO AT THE PARIS EXHIBITION. Valuable Details of Tobacco Culture; How to Raise a Good Burning Tobacco; How to Raise Mild or Strong Tobacco, as Required. Tobacco Culture and Statistics in Germany, Austria, Hungary, Belgium, France, Greece, Holland and Colonies, Italy, Spain and Colonies, Russia, Sweden, Roumania, Turkey, India, China, Japan, United States, and South America. Particulars of Snuff Manufactures, and the Manufacture and Flavoring of Chewing and Smoking Tobacco. The Most Approved Processes and Apparatus. The Automatic Torrifier, etc. The Manufacture of Cigars and Cigarrettes. Statistics of the Annual Consumption and Production of Tobacco, and the Revenues paid in the leading countries. Clear and Practical Information on every department of the Tobacco Trade. SUPPLEMENTS **133, 136.** Price 10 cents each.

ON THE PREPARATION OF DEXtrine Maltose (malt sugar) and its Use in Brewing. By Wm. George Valentine, F.R.S., Professor of the Royal College of Chemistry. An exhaustive and able paper, containing the most recent and reliable information. SUPPLEMENTS **19, 22, 25, 28.** Price 10 cents each.

MANUFACTURE OF VINEGAR BY Means of Bacteria.—By E. Wurm. Full description by the author of his mode of manufacture of vinegar by the bacteria method discovered by Pasteur, and which is one that gives immediately and without loss, a salable article of vinegar of excellent quality. For the production of wine vinegar this method is the only rational one, for in this case it is unnecessary to add alcohol. Contained in SUPPLEMENT **247.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Special Manufactures.

JAPANESE ART MANUFACTURES.—By Christopher Dresser, Ph.D., etc. Paper read before Society of Arts. The Japanese Potter at Work. Curious mode of Making Scarfs. How the Japanese Print on Cloth. Japanese Process for Silk Ornamentation. Japanese Weaving. How Fine Japanese Fans are made. Japanese Method of Making Moulds for Ornamental Castings for Vessels. Bronzes, etc. Japanese Lacquer Manufacture. Curious Method of Decorating Lacquer Work. The Love and Pursuit of the Beautiful in Japan. A very entertaining, instructive, and comprehensive paper. SUPPLEMENT **115.** Price 10 cents.

THE SMALL ARM FACTORY AT ENfield.—SUPPLEMENT **307.** Price 10 cents.

MANUFACTURE OF CITRIC ACID.—BY J. Carter Bell, F.C.S. An important practical pape for those who wish to embark in the manufacture of Citric Acid; pointing out errors to be avoided, and showing the best process to adopt in order to prevent the great loss which necessarily occurs by employing the methods ordinarily in vogue among manufacturing chemists. Contained in SUPPLEMENT **244.** Price 10 cents.

TO BLEACH JUTE.—SUPPLEMENT 249. Price 10 cents.

STEREOTYPING AND STEREOTYPing Machinery.—Description of the various apparatus; with eleven illustrative cuts. SUPPLEMENT **191.** Price 10 cents.

LAGER BEER.—HOW TO MAKE LAGER beer. How to make "Schenk" beer. How to make "Bock" beer. Full and practical directions for making beer at home. SUPPLEMENT **318.** Price 10 cents.

SOLDERING APPARATUS.—DESCRIPtion of the various new and improved devices that have been created to meet recent demands. With ten figures. SUPPLEMENT **187.** Price 10 cents.

SHOE PEGS AND PEGGING MAchines.—Descriptions, with nine cuts of various improved apparatus. SUPPLEMENT **197.** Price 10 cents.

WATER GLASS.—HISTORY OF WATER glass and formulæ for making it. A valuable and practical article. SUPPLEMENT **317.** Price 10 cents.

IMPROVED MILLING MACHINERY and Methods.—SUPPLEMENT **162.** Price 10 cents.

PAINTING UPON GLASS.—MATERIALS needed. Mixing the colors. Hints on painting. SUPPLEMENT **219.** Price 10 cents.

SOAP-MAKING MACHINERY.—ILLUStrated with six figures. On the Manufacture of Soap in Small Quantities without Boiling. SUPPLEMENT **258.** Price 10 cents.

MEASURING DEVICES.—DESCRIPTION of various apparatus for the purpose; with eight figures. SUPPLEMENT **200.** Price 10 cents.

Food Preparations.

SELECTION AND PREPARATION OF Food.—By Miss Ruth Smith. A valuable essay, in which is discussed the various classes of foods in common use, the amount of nutritive value in each, and the proper modes of preparing them for use. A paper of value in every household. Contained in SUPPLEMENT **271.** Price 10 cents. The same number contains a valuable article on the "Adulterations of Food," giving the results reached by Dr. Smart in his investigations, under direction of the National Board of Health to determine the prevalence of adulteration in food supplies.

THE SALT MANUFACTURE OF MICHIgan.—By S. S. Garrigues, Ph.D. One engraving. A Complete and Instructive Description of Salt Making. The Well-boring Machinery. Pumping and Evaporating Brine. Kettle and Pan Blocks. Solar and Steam Evaporation. Grades, Qualities, and Analyses of Salt. Tabular Statement of Companies, Capital, Amount of Salt produced, number of Kettles, etc. Cost, Profit, Labor, and Details. Contained in SUPPLEMENT **102.** Price 10 cents.

AMERICAN MILLING METHODS.—An important paper read by Mr. Albert Hoppin, before the Pennsylvania State Millers' Association, on the milling processes at present employed in the United States. Review of the progress made during the last decade. The "Old Style Process." The "New Process." Detailed description of the "Gradual Reduction Process;" its advantages pointed out; how it may be applied in small mills which are employing other methods. Contained in SUPPLEMENT **303** Price 10 cents.

FOOD PRODUCTS OF THE PARIS EXhibition. Soups and Tablets, Soup Balls, Dried Vegetables, Prepared Beans, Crystallized and Dried Fruits, Dried Apple Sauce, Dried Eggs, Gelatines, French Confectionary, Nougat, Pure Licorice, Coffee Substitutes, Sugar Coffee, Chocolate. SUPPLEMENT **151.** Price 10 cents.

PRINCIPLES OF BUTTER MAKING.—By Dr. Voelcker. SUPPLEMENT **302.** Price 10 cents.

BREWING IN AUSTRIA.—DESCRIPtion and illustrations of an Austrian brewing plant. With eleven figures. SUPPLEMENT **256.** Price 10 cents.

HOW TO TEST TEA FOR ADULTERAtions.—By A. W. Blyth, M.R.C.S. SUPPLEMENT **201.** Price 10 cents.

PORTLAND CEMENT.—BY MR. WATson. Its history and method of manufacture. SUPPLEMENT **231.** Price 10 cents.

HOW GOLD LEAF IS MADE. SUPPLEMENT **253.** Price 10 cents.

SHEARING STRENGTHS OF SOME American Woods.—By John C. Trautwine, C.E. SUPPLEMENT **242.** Price 10 cents.

PRODUCTION AND COMMERCE OF Lac.—By P. L. Simmonds. SUPPLEMENT **238.** Price 10 cents.

Refrigeration.

ICE-HOUSE AND REFRIGERATOR.—Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept dry and pure throughout the year at a temperature of 34° to 36°. SUPPLEMENT **116.** Price 10 cents.

SIR JOSEPH WHITWORTH.—AN INteresting account of the life and labors of England's great mechanic, whose name is distinguished in connection with improvement in the workshop tools of the present century. The production of machine tools. The first true planes ever made. The development of the principle of the slide. Improvement of the screw. Measuring machine. The Whitworth gun. Improvements in ordnance. Compressed steel. Whitworth scholarships for the encouragement of young men in technical education. Whitworth knighted by the Queen. Contained in SUPPLEMENT **248.** Price 10 cents.

MACHINES FOR PRODUCING COLD Air.—A paper read by Mr. T. B. Lightfoot, before the Institution of Mechanical Engineers, London, giving a brief description of each of the machines hitherto devised for producing cold air; and including the theory construction, and practical working of a greatly improved form of apparatus for the same purpose. Illustrated with an engraving giving perspective view of one of these machines as constructed for marine purposes, and intended to supply 5,000 cubic feet of cold air per hour. Contained in SUPPLEMENT **274.** Price 10 cents.

FREEZING MIXTURES.—THE SEVeral Methods of Lowering Temperature. Experiments. Tabular statement of Freezing Compounds and their relative Efficiency and Cost. By Prof. Meidinger. SUPPLEMENT **89.** Price 10 cents.

ICE AND ICE-HOUSES—HOW TO MAKE ice ponds; amount of ice required, etc., and full directions for building ice-house, with illustrated plan. SUPPLEMENT **55.** Price 10 cents.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. SUPPLEMENT **59.** Price 10 cents.

DRY AIR REFRIGERATING MACHINE.—Description of Hall's improved horizontal dry air refrigerator, designed to deliver about 10,000 cubic feet of cold air per hour, when running at a speed of 100 revolutions per minute, and capable of reducing the temperature of 90° above to 50° below zero. With five figures, showing plan and side elevation of the apparatus, and diagrams illustrative of its performance. Contained in SUPPLEMENT **288.** Price 10 cents.

ICE MAKING AND ICE MACHINES.—By W. N. Hartley, F.R.S.E. Enumerating the several Processes. Carre's Ammonia Freezing Machine; the Sulphurous Acid Process used at the Chelsea Ice Rink, etc. The Laws of Cohesion and Heat. Sideley & Mackay's Process, and Description and Plans of their Factory in operation at Manchester, Eng. Particulars and dimensions of Apparatus, Quality, and Quantity of Ice produced, Cost, Profit, and other facts proving the Practical Success of this manufacture. SUPPLEMENTS **85, 91.** Price 20 cents for the two.

Chemical Industries.

THE HISTORY OF ALIZARIN AND Allied Coloring Matters, and their Production from Coal Tar.—By W. H. Perkins, F.R.S. A very valuable and exhaustive paper, giving in: LECTURE I. A consideration of the most important of the products that have been obtained in recent years from coal tar. Alizarin and allied coloring matters. Up to 1869 Madder was the only source of Alizarin, and one of the most important dyestuffs known. Botanical history of Madder. The preparations of madder, "Garance" and "Garancine." Properties of Madder and mode of dyeing with it. The coloring matters of Madder. "Alizarin" and "Purpurin," their chemical composition. A lengthy account of the efforts of chemists to obtain the correct chemical formula of Alizarin. The manufacture of artificial Alizarin; the failures of chemists at first to obtain a product identical with that derived from Madder. The present aspect of the question. This interesting lecture is devoted entirely to the chemistry of the subject. LECTURE II. The technology of Alizarin manufacture. The manufacture of the raw material, "Anthracene." Use of coal tar pitch for this purpose. Apparatus for its distillation. Purification of the crude material. The apparatus illustrated and described. Description of the dichloranthracene process. The chlorine apparatus illustrated. Chlorine ovens for treating the anthracene with chlorine illustrated and described. Process of converting the dichloranthracene into sulpho-acids of anthraquinone. The converting apparatus. Conversion of the first product—"Soda Salt"—into coloring matter. The process and apparatus; vacuum filters and soda salt converter. The rationale of the process. The Anthraquinone method; full and minute description. The dichloranthracene process gives a superior product. The present consumption of artificial alizarin. Commercial results of the new alizarin industry, and its influence on the sale of madder and derivatives. These two highly valuable and instructive lectures, illustrated with seven engravings, are contained in SUPPLEMENT **186** and **187.** Price 10 cents each, or 20 cents for the two.

EXTRACTION OF GREASE FROM Wool.—A paper of great importance to those engaged in wool manufacturing, pointing out a process by means of which the raw material may be treated so as to yield not only a better quality of product, but also a substance of great value to both the woolen manufacturer and the leather dresser, for whose use large quantities of "de gras" are now imported. Contained in SUPPLEMENT **261.** Price 10 cents.

JAPANNING AND JAPANS.—A PRACtical and valuable article on preparing work for japanning. Applying the japan. Composition and preparation of japans for different purposes. Grounds for japan. Number of coats necessary. Baking the japan, etc. SUPPLEMENT **316.** Price 10 cents.

FIRE-WORKS FORMULÆ.—COLORED lights for parlor theatricals. White, yellow, green, red, pink, and blue lights. Fires: white, yellow, red, blue, green, and bengal fires. Colored stars for rockets. Rocket composition. Composition for pin-wheels, etc. SUPPLEMENT **317.** Price 10 cents.

CONCERNING AMBER.—BY ERMINNIE A. Smith. Paper read before the Amer. Assoc. Adv. Science. SUPPLEMENT **226.** Price 10 cents.

MANUFACTURE OF CHLORIDE OF Lime.—Description of the Weldon process. SUPPLEMENT **206.** Price 10 cents.

INDUSTRIAL CHEMISTRY—BRIEF REview of the most important changes in the applications of, within the last few years.—By J. W. Mallet. Treating of; *Materials and Processes Connected with the Construction of Buildings.* 1. Chief building materials for external use, stone, and brick. 2. Lime burning, mortar and hydraulic cements. 3. Stucco. 4. Preservation of timber. 5. Glue and other cements of various applications. 6. Pigments for the use of house painters. 7. Vehicles for paints. 8. Varnishes. *Building appliances.* A. Explosive agents, used in blasting and otherwise. B. Disinfectants. Contained in SUPPLEMENT **277** Price 10 cents.

DISTILLATION AND RECTIFICATION of Alcohols by the Rational use of Low Temperatures.—By Raoul Pictet. SUPPLEMENT **299.** Price 10 cents.

PHOTO CHEMICALS; THEIR MANUfacture and Properties.—By John L. Gihon. Nitrate of Silver. Iodine, and the Iodides of Ammonium, Cadmium, Lithium, Potassium, Silver, Sodium, Zinc. Bromides of Ammonium, Cadmium, Potassium, Silver, Sodium. Chlorides of Sodium, Gold, Strontium. Pyroxylin, or Soluble Cotton. Alcohol, Sulphuric Ether, Acetic, Citric, Nitric, and Pyrogallic Acids, Protosalts of Iron. Hyposulphite of Soda, Cyanide of Potassium, Bichromate of Potash, Gelatine, Glycerine. Useful List of Chemicals needed by the Photographer. SUPPLEMENT **114.** Price 10 cents.

WATERPROOFING PAPER.—DESCRIPtion of Three Processes of Waterproofing Paper and Ligneous Tissues. By Daniel Felton, Manchester, England. SUPPLEMENT **96.** Price 10 cents.

WOOL DYEING.—BY GEORGE JARmain. Lectures read before the Society of Arts, London. An excellent and complete description, embracing the following: The water required; impurities, and tests therefor; the influence of these aqueous impurities on scouring, rinsing, and dyeing; scouring materials; wool, cloth, and yarn scouring; wool bleaching; tinting or dyeing white, indigo, woad, madder, bran, lime, etc.; vats of various kinds, extracts of indigo, yellow colors, quercitron bark, ammoniacal cochineal, flavin, eosine, and many other dyes treated in full; fast and loose colors; fixation of color, mordants, lakes, alum, copperas, etc. SUPPLEMENTS **55, 74, 75, 76.** Price 10 cents each, 40 cents for the four.

PROGRESS OF INDUSTRIAL CHEMistry.—Heavy Chemical Manufactures. *Sulphur.*—Source of supply, method of extraction, industrial uses, and amount of consumption. *Acids*—Sulphuric, nitric, hydrochloric, acetic, and oxalic—methods of preparation, and improvements in processes. *Alkalies (carbonates and hydrates).*—Potash; the great revolution that its production has undergone during the last twenty years, and the present method of preparing it. Soda: recent history of its manufacture, involving an account of the improvements in, and modifications of the Leblanc process, and of the methods that have been substituted for it. Ammonia: the source of supply and the method of treating it. Contained in SUPPLEMENT **204.** Price 10 cents.

PROGRESS OF INDUSTRIAL CHEMIStry.—By J. W. Mallet. The latest and most approved processes, and the latest experimental results in the manufacture of the following important commercial products: Niter, Potassium Chloride, Potassium Sulphate, Potassium Chlorate, Pyro-Chromate, Potassium Ferrocyanide, Potassium Cyanide, Sodium Chloride, Sodium Nitrate, Sodium Sulphate, Borax, Ammonium Chloride, Calcium Chloride, Calcium Chlorate, and Magnesium Sulphate. Contained in SUPPLEMENT **214.** Price 10 cents.

THE COAL TAR COLORS.—A LECTURE before the Society of Arts, by George Jarmain. Aniline, Toluidine, Magenta, their Manufacture. Chemical Reactions, etc., fully treated. Instructions and Recipes for Dyeing with the Aniline Crimson. Violet, Blues, Greens, Brown, Black, Yellow, Picric Acid, and Ponceau. Dyeing Mixed Fabrics of Cotton and Wool. Excellent suggestions to Dyers. SUPPLEMENT **68.** Price 10 cents.

OUR DOMESTIC POISONS.—BY HENRY Carr, M. Inst. C.E. A paper read before the London Society of Arts, designed to draw attention to certain poisonous materials which are headlessly introduced into, or intentionally used for some special purpose in our domestic fabrics. Arsenic the great poison. Its presence in wall papers, cotton fabrics, artists' water colors, ordinary paint, tin plate work, artificial flowers, lamp shades, paper collars and cuffs, fancy papers, confectionery, etc. The symptoms of chronic poisoning by arsenic. Cases of poisoning from the emanations from arsenic wall papers. Why arsenic is used by paper stainers. Discussion of the facts contained in the foregoing lecture. Contained in SUPPLEMENTS **219** and **220.** Price 10 cents each.

PROGRESS OF INDUSTRIAL CHEMIStry. By J. W. Mallet. *Materials Used as Food.* Bread, Meat, Meat Extracts, Preserved Vegetables, Butter and Cheese, Sugar, Wine, Beer, Distilled Spirits, Vinegar, Artificial Mineral Waters, Artificial Flavoring Essence. Brief review of the most important changes in the industrial application of chemistry to these materials within the last few years. Contained in SUPPLEMENT **237.** Price 10 cents.

ON THE COLORING MATTERS DErived from Coal Tar. By Prof. Adolph Wurtz. An elucidation of the Chemical Processes for obtaining Nitro-toluene, Toluidine, Aniline, Rosaniline, Phenylamine, Artificial Madder, and other Dyes. The Industrial Processes employed for their Production, and clear explanations of the Chemical Reactions, with Formulæ and Diagrams. SUPPLEMENT **57.** Price 10 cents.

PARAFFINE—WHAT IT COMES FROM; Several Methods of Manufacture: How to obtain the Best Results: the Yield of Tar; Composition of Paraffin. SUPPLEMENT **119.** Price 10 cents.

IODINE, EXTRACTION OF, FROM SEAweeds.—By Dr. Thiercelin. Description of a new and improved process for extracting iodine and potash from the light ashes of seaweeds. The species of seaweeds richest in Iodine. Best time and season for gathering. Preliminary preparation. Method of extracting the iodine and potash. Contained in SUPPLEMENT **246.** Price 10 cents.

INDUSTRIAL CHEMISTRY.—BRIEF Review of the most important industrial applications within recent years. By J. W. Mallet. 1. *Materials Used in Washing.* Soap. Accessory Materials Used in Washing. Perfumes. 2. *Materials for Writing, Printing, etc.* Ink. Mucilage. Artists' Pigments. Contained in SUPPLEMENT **287.** Price 10 cents.

SULPHATE OF SODA.—BY JAMES Mactear, F.C.S. A history of the former methods of manufacturing sulphate of soda or "salt cake," and the inconveniences connected therewith, followed by a detailed description of the author's new mechanical furnace, and of his new continuous system of manufacturing this important chemical product. By the use of the Mactear system thirty per cent. is saved in the manufacturing costs; the operation is continuous, and yields a much more uniform product; the space occupied by the plant is greatly reduced, the escape of deleterious acid fumes is suppressed, and rock salt may be worked quite as easily as common salt. A technical paper of great importance to manufacturing chemists. Contained in SUPPLEMENT **277.** Price 10 cents. The same number contains an article on a "New Process for Extracting the Iodine contained in Seaweeds," by Messrs. Laurdt & Collett.

SULPHATE OF SODA.—BY JOHN HARgreaves. A valuable paper, giving a detailed description of the Hargreaves & Robinson direct process of manufacturing this important commercial product. Contained in SUPPLEMENT **270.** Price 10 cents.

PROGRESS OF INDUSTRIAL CHEMISTRY.—By J. W. Mallet. 1. *Manufacture of Glass*—Materials, Furnaces, Processes of Glass Working, Annealing, Optical Glass, Decoration of Glass Work. 2. *Manufacture of Porcelain and other Clay-ware.*—General Character of Products, Mechanical Appliances, Kilns, Decoration. Contained in SUPPLEMENT **232.** Price 10 cents.

PROGRESS OF INDUSTRIAL CHEMIStry.—By J. W. Mallet. A brief review of the most important changes in the industrial applications of chemistry within the last few years, treating of new processes and approved appliances in the manufacture of the following important products: Calcium acid phosphate, aluminum sulphate, alum, iron and copper sulphates, iodine, potassium iodide, bromine, phosphorus, carbon disulphide, arsenic acid, oxygen gas, and various organic chemicals. Descriptions of mechanical applications of chemical manufactures in general, such as improved grinding mills, heating by vapor under pressure, ice machines, machines for agitating and stirring, vacuum pans, apparatus for distillation, centrifugal machines, and filter presses. Contained in SUPPLEMENT **221.** Price 10 cents.

ON A NEW CHEMICAL INDUSTRY.—By M. Camille Vincent. Description of a new and ingenious process by means of which the waste liquors from the still in the beet-sugar industry, which were formerly thrown away as useless, are now converted into two valuable commercial products—Ammonia and Chloride of Methyl, the latter used in the production of Methylated dye colors, With 2 engravings. SUPPLEMENT, No. **172.** Price 10 cents.

SEPARATION OF HYDROCARBON OILS from Fat Oils.—By Alfred H. Allen, F.C.S., F.I.C. SUPPLEMENT **307.** Price 10 cents.

SOAP, FROM A CONSUMER'S POINT OF View.—SUPPLEMENT **308.** Price 10 cents.

LORENZEN'S NEW AMMONIA APPAratus for the production of ammonia by the calcination of bones.—With four figures. SUPPLEMENT **284.** Price 10 cents.

DRIED FOAM; MODE OF PREPARING gelatine in this form.—By R. Brooks. SUPPLEMENT **300.** Price 10 cents.

HEVEENOID.—BY H. A. MOTT, JR., M.D. Description of a new product destined to supplant soft and hard vulcanized rubber. SUPPLEMENT **233.** Price 10 cents.

Photography.

GELATINO-BROMIDE PLATES.—BY A. J. Jarman. A valuable paper, giving complete, practical directions by means of which any one can prepare plates for the gelatino-bromide process at home. The Apparatus to be procured. The Materials. How to make the Sensitized Emulsion. How to Prepare the Plates. How to Develop the Picture, and the Method of Intensifying a weak Negative. The method here given is sure, and easy to manage in the hands of any one possessing a small amount of knowledge of photographic manipulation, and will be found of the greatest value to those seeking accurate practical information on this subject. SUPPLEMENT, No. **190.** The same number contains an interesting article by Samuel Fry, entitled, *Reasons for Preferring Dry Plates to Wet Collodion*, in which the author puts forth a powerful plea in favor of the Dry Process, the result of long, practical experience. Price 10 cents.

PHOTOGRAPHIC PRINTING PROCESSes.—By C. Bauman. Asphaltum processes; lichtdruck (light-printing); relief printing; photo-lithography and photo-zincography; heliographic process; Aubel method. SUPPLEMENT **82.** Price 10 cents.

HOW TO USE PHOTOGRAPHIC BACKgrounds.—An address delivered before the Photographic Congress, Philadelphia, by L. W. Seavy. With 14 illustrations. A valuable paper, explaining the various methods of so using backgrounds as to produce the best effects, with examples of the wrong methods. Full of useful practical ideas for photographers. SUPPLEMENTS **48, 49.** Price 10 cents each.

PHOTOGRAPHS ON WOOD FOR ENgraving. By Edward Pocock. Practical Directions for Transferring Photos that will not Cut Up under the Graver. Also, a method of developing a Photo on Wood which may be Penciled on if desired, with instructions. SUPPLEMENT **53.** Price 10 cents.

GELATINE PLATES.—DESCRIPTION of apparatus used in Berlin for the preparation of gelatine plates. 1. Mixing apparatus for gelatine emulsion. 2. Digestive apparatus. 3. Triturating apparatus. 4. Washing apparatus. With three figures. Contained in SUPPLEMENT **299.** Price 10 cents. The same number contains an article by A. L. Henderson, directing "How to Make Emulsion in Hot Weather."

LANTERN SLIDES AND TRANSPARences; How to make.—By Wm. Brooks. SUPPLEMENT **173.** Price 10 cents.

HOW TO MAKE HELIOTYPIC PRINTing Plates.—SUPPLEMENT **205.** Price 10 cents.

PHOTOGRAPHIC ENGRAVING.—BY Capt. J. Waterhouse, B. Sc. SUPPLEMENT **158.** Price 10 cents,

A GOOD MOUNTING MATERIAL FOR Carbon and Silver Prints.—By Francis Dann. SUPPLEMENT **172.** Price 10 cents.

GELATINE PHOTO PROCESS.—A practical demonstration of the mode of working the gelatino-bromide process. By D. Van Monckhoven. Treating of the organization of the dark-room, the nature of the emulsion, the preparation of the gelatino-bromide emulsion, application of the emulsion to glass, the preservation of the prepared plates, exposure in the camera, development of the image, pyro development, fixing and intensifying the image, and retouching and varnishing. Illustrated with two cuts. Dr. Van Monckhoven, the author, is one of the most eminent chemists and photographers. The above paper is a most valuable contribution to the art of dry-plate photography. Contained in SUPPLEMENT **205.** Price 10 cents.

RECENT ADVANCES IN PHOTOgraphy.—By Capt. Abney, F.R.S. A recent lecture before the London Society of Arts, recapitulating the new processes and improvements that have been introduced into the art of photography during the last few years. The gelatino-bromide process and its advantages and disadvantages over the old wet process. Photo plates without glass. Photographs of the invisible. Oxidation of the photo film. Platinum pictures. Ferrous oxalate pictures. New mode of photo-printing. Other new modes of photo-printing. Photography in natural colors. Seeing by photography. Discussion by the Society of Arts. Contained in SUPPLEMENT **237.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Photography.

PHOTO-MICROGRAPHY.—BY GEORGE E. Davis, F.R.M.S. A practical treatise on the art of taking photographs of microscopic objects. Construction of camera. The microscope and its arrangement. Method of illumination. Exposure of the gelatine plates. Development of the plate. Two useful applications of the art of photo-micrography. Illustrated with one figure showing arrangement of apparatus. Contained in SUPPLEMENT **284**. Price 10 cents.

PORCELAIN PHOTOGRAPHY.—BY J. R. Sawyer. A valuable paper detailing the processes involved in the manufacture of porcelain for photography, and describing the methods of decorating it by the photographic art. *Manufacture*—Firing; dipping; trimming; glazing; firing in the glost oven. *Decoration by photography*—Monochrome; application of photographs to enamels or porcelain; working in colors, under and over glaze; firing or burning in. Contained in SUPPLEMENT **256**. Price 10 cents.

SENSITIVE PLATES.—BY J. H. FORrest. To make gelatine dry plates, the substratum, and the emulsion; how to wash the emulsion; coating and drying the plates; intensifying; the plate drying box. Illustrated with four figures. Contained in SUPPLEMENT **272**. Price 10 cents.

PHOTO-PRINTING. — BY T. BOLAS, F.C.S. An interesting description of the celebrated "Woodbury Process" of carbon or autotype printing. Giving directions, in minute detail, for preparing the gelatine; making, sensitizing, and exposing the tissue; and preparing the relief, and the lead mould. Describing the preparation of the ink and presses used, and directing how the printing should be done. Contained in SUPPLEMENT **213**. Price 10 cents.

PRINTING BY PHOTOGRAPHY.—BY Thomas Bolas, F. C. S. Lectures before the Society of Arts, London. Photo-lithography and Photo-zincography. Phototypic or Raised Printing Blocks, by Swelled Gelatine Process. Zinc Etching, and other methods. Line Engraving on Metal Plates. Printing of Half-tone Subjects from Metal. Application of Asser's Process. Talbot's Photo-engraving. Woodbury's Methods of Engraving and Printing. Collotype Printing. Other Methods of Producing Photos in Pigment. Dusting-on Process. Autotype Printing. SUPPLEMENTS, **143, 146**. Price 10 cents each.

DRY PLATE PHOTOGRAPHY.—The Gelatine Process. A complete and practical description of the method of preparing the sensitive gelatine emulsion. By D. Van Monckhoven, the well known chemist and photographic discoverer. Being a report of his recent lecture before the members of the Belgian Photographic Association. These gelatine dry plates are more sensitive than the ordinary wet plates, and Dr. Van Monckhoven believes that the gelatine plates will sooner or later supersede wet plate photography and other forms of dry plate practice. The lecture embraces: (1) The Organization of the Dark Room. (2) The Nature of the Emulsion. (3) Preparation of the Gelatino-Bromide Emulsion. (4) Application of the Emulsion to the Glass. (5) The Preservation of the Prepared Plates. (6) The Exposure in the Camera. (7) Development of the Image. (8) The Pyro-development. (9) Fixing the Image. (10) Intensifying the Image, (11) Retouching and Varnishing. With two Illustrations. Contained in SUPPLEMENT **205**. Price 10 cents.

PHOTOGRAPHY.—REPRODUCTION OF Negatives.—By W. T. Wilkinson. SUPPLEMENT **310**. Price 10 cents.

PHOTO PRINTING IN MUNICH.—Albert's establishment. SUPPLEMENT **304**. Price 10 cents.

DRYING STOVE FOR PRINTED Sheets.—Illustrated. SUPPLEMENT **304**. Price 10 cents.

GELATINE EMULSION.—NEW METHOD of making. SUPPLEMENT **303**. Price 10 cents.

PHOTOMETRICAL RESEARCHES. — SUPPLEMENT **294**. Price 10 cents.

STREAKS IN GELATINE PLATES.—SUPPLEMENT **297**. Price 10 cents.

SOLARIZATION OF DRY PLATES.—SUPPLEMENT **300**. Price 10 cents.

NEW METHOD OF TAKING TRANSparent Positives.—By Capt. Bixby. SUPPLEMENT **307**. Price 10 cents.

PRACTICAL HINTS ON SAVING SILVER and Gold Wastes.—By Chas. Cooper & Co. SUPPLEMENT **307**. Price 10 cents.

PAPER — NEGATIVE PROCESS. — BY William Brooks. SUPPLEMENT **284**. Price 10 cents.

PHOTO-TRACINGS IN BLOCK AND Color.—SUPPLEMENT **286**. Price 10 cents.

DRY PLATES—ROCHE'S MODE OF DEveloping the Eastman Gelatine Dry Plates. SUPPLEMENT **301**. Price 10 cents.

HOW TO TAKE POSITIVES IN THE Camera Direct.—By J. B. Obernetter. SUPPLEMENT **293**. Price 10 cents.

COMPOSITION FOR RENDERING Photographic and other Prints Transparent.—By E. W. Poston. SUPPLEMENT **297**. Price 10 cents.

SILVER AND GOLD WASTES.—HINTS on Saving. By C. Cooper & Co. SUPPLEMENT **307**. Price 10 cents.

A NEW METHOD OF TAKING TRANSparent Positives. — By Captain Bing. SUPPLEMENT **307**. Price 10 cents.

PHOTOGRAPHIC NOTES — A COLlection of valuable recipes and observations. SUPPLEMENT **286**. Price 10 cents.

PHOTOGRAPHIC PRINTINGS.—BY John L. Gihon. Items of information on every Class of Work, as Plain and Albumen, Porcelain and Carbon Printing. Paper for Printing, and its Preparation. The Sensitizing Bath. Printing and its results. Toning. Fixing the Image. Prints on Plain Paper. Permanent Pigment Printing. SUPPLEMENT **144**. Price 10 cents.

GELATINE PLATES. — APPARATUS used in Berlin for their Preparation. SUPPLEMENT **299**. Price 10 cents.

GELATINE EMULSIONS, EXCESS OF Silver Nitrate in.—Addition of Resin. Retouching. —SUPPLEMENT **295**. Price 10 cents.

TO TAKE POSITIVES IN THE CAMERA Direct.—By J. B. Obernetter. SUPPLEMENT **293**. Price 10 cents.

A NEW SUN DIAL.—BY M. GROOTten. With one figure. SUPPLEMENT **259**. Price 10 cents.

HOW TO MAKE PHOTO PRINTING Plates.—By T. Bolas, F.C.S. SUPPLEMENT **167**. Price 10 cents.

COLLOTYPES ON ZINC PLATES.—BY J. Husnik. SUPPLEMENT **168**. Price 10 cents.

BEETROOT PHOTOGRAPHS.—BY M. Pellet. SUPPLEMENT **166**. Price 10 cents.

FLEXIBLE NEGATIVES. — HOW TO make. By A. W. Turner. SUPPLEMENT **195**. Price 10 cents.

HOW TO DETACH NEGATIVES FROM their Glass Supports. SUPPLEMENT **178**. Price 10 cents.

HOW TO PHOTOGRAPH ON WOOD.—By T. C. Harris. SUPPLEMENT **184**. Price 10 cents.

THE PHOTOCOLOTYPE PROCESS.—By T. Bolas, F.C.S. SUPPLEMENT **174**. Price 10 cents.

PHOTOGRAPHY IN COLORS.—BY K. Versnaeyen. SUPPLEMENT **175**. Price 10 cents.

DAMAR VARNISH FOR NEGATIVES: To Make. SUPPLEMENT **169**. Price 10 cents.

TO MAKE VIGNETTES BY MEANS OF Gelatino-chromate. By Dr. J. Schnauss. SUPPLEMENT **169**. Price 10 cents.

THE PHOTO-LITHOGRAPHIC PROCESS.—By Henry Butter. SUPPLEMENT **227**. Price 10 cents.

HOW TO TAKE PHOTOGRAPHS OF Microscopic Objects.—By Carl Seiler. SUPPLEMENT **212**. Price 10 cents.

PHOTO-PRINTING.—THE WOODBURY Processes. SUPPLEMENT **213**. Price 10 cents.

PHOTOGRAPHING COLORS.—BY FRED. E. Ives. A valuable paper. SUPPLEMENT **216**. Price 10 cents.

HOW TO MAKE A CHEAP AND SIMPLE Camera for the Microscope. By T. B. Jennings. With two figures. SUPPLEMENT **218**. Price 10 cents.

PHOTOGRAPHING BY GAS LIGHT.—By J. Urie. SUPPLEMENT **222**. Price 10 cents.

GELATINE EMULSIONS FOR AMAteurs.—By W. D. Richmond. SUPPLEMENT **226**. Price 10 cents.

PHOTOMETER FOR THE PHOTOgraphic Studio.—Description and figure of a useful instrument devised by Dr. Van Monckhoven. SUPPLEMENT **204**. Price 10 cents.

METHODS OF OBTAINING POSITIVES in the Camera.—By Fr. Jahns. SUPPLEMENT **255**. Price 10 cents.

HOW TO TREAT FADED PRINTS for copying.—SUPPLEMENT **248**. Price 10 cents.

A NEW DEVELOPER.—BY CAPT. W. De W. Abney, F. R. S. SUPPLEMENT **243**. Price 10 cents.

A NEW PHOTOMETER.—WITH 2 FIGures. SUPPLEMENT **237**. Price 10 cents.

SUBSTANCES HAVING THE POWER to Develop the Latent Photographic Image. By M. Carey Lea. SUPPLEMENT **239**. Price 10 cents.

RAPID DRY PLATES. BY H. W BEvan. SUPPLEMENT **229**. Price 10 cents.

HOW ENGLISH OPERATORS WORK with Gelatine Plates. By J. Hay Taylor. An article giving the whole routine of working with gelatine plates in England. A thoroughly practical article. SUPPLEMENT **313**. Price 10 cents.

PAPER NEGATIVES.—INSTRUCTIONS and Recipes for this Process. The Cyanotype Process, Coloring and Preserving Photos, etc. SUPPLEMENT **95**. Price 10 cents.

NEGATIVES.—REPRODUCTION AND multiplication of. By Ernest Edwards, B.A. SUPPLEMENT **303**. Price 10 cents.

RETOUCHING FOR BEGINNERS.—BY Henry Morgan. With one figure. SUPPLEMENT **276**. Price 10 cents.

Gas, Gas Making, Etc.

GAS AND GAS MAKING.—BY L. P. Gratacap, Ph.B. The Product—Analyses of gas from various coals, showing the ordinary constituents and their quantitative relations. Description of the nature and properties of the additional obscure compounds that enter into the composition of illuminating gas. The Gas Flame —Theory of the burning jet. Products of combustion. Composition of coal gas flame. Influence of pressure on coal gas. Deterioration of gas by standing in contact with oil, etc. Aiken's experiments. Contained in SUPPLEMENT **233**. Price 10 cents.

RELATIVE ILLUMINATING VALUE OF the Hydrocarbon Vapors Present in Coal Gas, and their Quantitative Determination.—By G. E. Stevenson. Description of an important series of experiments by Dr. Knublach, Chemist at the Cologne Gas Works, which have had for their result the important discovery that equal volumes of the vapors of benzol, toluol, and other homologues of this series of hydrocarbons give when burned in a gas burner, in connection with coal gas, practically the same result in increase of illuminating power, and produce a result six times as great as that produced by the admixture of the same quantity by volume of hydrocarbon gases of the ethylene or olefiant series. Contained in SUPPLEMENT **251**. Price 10 cents.

THE CHEMISTRY OF GAS MANUFACture. By A. Vernon Harcourt, F.R.S., one of the Metropolitan Gas Referees. An interesting and valuable paper, showing the Origin of Coal. How Coal was Formed. Greatest Depth for Coal. Changes in Coal by Heat. Oil from Coal. Gases from Coal. Other Substances Derived from Coal. Varieties of Coal. Coal Tar and its Remarkable Products. Naphtha. Benzol. Creosote. Anthracene Oil. Pitch Coke. How Aniline is produced. Mauve. Anthracene. SUPPLEMENT **72**. Price 10 cents.

GAS AND ELECTRICITY AS HEATING Agents. By Dr. C. W. Siemens, F.R.S.—An interesting lecture on the production of heat-energy, wherein the eminent author endeavors to prove that for all the ordinary purposes of heating and melting, gaseous fuel should be employed; but that for the attainment of extreme degrees of heat, the electric arc possesses advantages which are unrivaled by any other known source, its heat not only being available within a focus of extremely contracted space, but also being capable of producing such larger effects as will render it useful in the arts for fusing iridium, platinum, iron, etc., or for effecting reactions and decompositions that require intense heat, coupled with freedom from those disturbing influences that are inherent to furnaces in which carbonaceous fuel is burned. Contained in SUPPLEMENTS **276** and **278**. Price 10 cents each.

GAS ENGINEERING.—THE AMOUNT of capital invested in gas manufacture in America. How this department of engineering was represented at the Paris Exhibition. Description of the Multitubular Condenser, and of the Livesey Scrubber. Contained in SUPPLEMENT **204**. Price 10 cents.

COMPARATIVE VALUE OF GAS AND Coal.—By Geo. S. Dwight. An interesting paper, giving some curious speculations about the waste of coal due to the extravagant methods now in vogue in all civilized centers in obtaining the thermal effects of this fuel; showing how a reformation of so glaring an evil may be effected, and how the losses may be reduced; and pointing out the advantages to be derived from the use of water-gas, which the author believes is destined to become the "fuel of the future." Contained in SUPPLEMENT **216**. Price 10 cents. The same number contains a valuable article on the "Heating Power of Coal Gas," by Dr. Wm. Wallace.

NEW CONTINUOUS AMMONIA PROcess.—Description of a new process for the extraction of ammonia from gas liquor, which has the merits of simplicity, cheapness, and efficiency—the apparatus for the purposes occupying little space, demanding little attention, and extracting all the ammonia from gas liquor down to 1 part in 2,000, or 0·05 per cent. Illustrated with two figures showing elevation and section of the apparatus. Contained in SUPPLEMENT **281**. Price 10 cents.

GAS PURIFICATION: NEW PROCESS based on the Direct Utilization of its Impurities in the Production of Commercial Salts.—An important technical paper by G. Valentine, F.C.S., describing a new method, originated by him, of purifying gas by its own impurities in closed vessels, with the production of various valuable commercial salts. Illustrated with two figures showing theory of the process and sectional view of the apparatus. Contained in SUPPLEMENT **305**. Price 10 cents.

HYDROGEN GAS, PROCESS AND APparatus for Producing.—By C. M. Tessie Du Motay. Full description of a process for producing hydrogen by the conversion of superheated steam carrying with it a certain amount of naphtha vapor or its equivalent, in the presence of highly heated lime. By means of the apparatus here described and illustrated, hydrogen gas can be continuously produced by the employment of two sets of superheaters and two converting furnaces, which can be alternately used. Illustrated with nine engravings. Contained in SUPPLEMENT **241**. Price 10 cents.

CHEAP GAS FOR GAS MOTORS, ETC. —A paper by J. Emerson Dawson, describing an effective apparatus for easily producing a heating gas by the decomposition of steam in the presence of incandescent carbon, at a net cost of six cents per 1,000 cubic feet. Useful for fuel and for gas engines. Contained in SUPPLEMENT **305**. Price 10 cents.

PROGRESS OF GAS MANUFACTURE. Presidential Address to North British Association of Gas Managers. History of Gas Lighting, and Progress in Retorts. The Hydraulic Main; Gas Condensers; Washers and Scrubbers; Gas Purification; Exhausters and Governors; Gas Holders; Mains and Service Pipes; Electric *vs.* Gas Lighting. SUPPLEMENT **140**. Price 10 cents.

CONCRETE GAS-HOLDER TANKS.—Illustrated. SUPPLEMENT **306**. Price 10 cents.

NEW GAS BURNER.—ILLUSTRATED. SUPPLEMENT **302**. Price 10 cents.

THE MUCK DELUSION.—SUPPLEMENT **301**. Price 10 cents.

SIEMENS' REGENERATIVE GAS Burners.—With two cuts. SUPPLEMENT **301**. Price 10 cents.

FRENCH TELESCOPIC GAS HOLDER. —Description in detail, with plan, view and elevation of apparatus. SUPPLEMENT **290**. Price 10 cents.

CHEAP GAS FOR MOTORS.—SUPPLEMENT **305**. Price 10 cents.

APPARATUS FOR THE ANALYSIS OF Gas.—Description and figure of Orsat's new portable apparatus for quick and oft-repeated analysis of gas in manufactories, etc. SUPPLEMENT **250**. Price 10 cents.

PHYSICS, CHEMISTRY, ETC.

Electricity and Electric Apparatus.

ELECTRIC LAMPS.—A COMPREHENsive paper embracing descriptions, illustrated with 38 engravings of all the principal electric lamps now in use, viz., The Brush Electric Lamp and the Brush Hanging Lamp, Wallace-Farmer Lamp, Maxim's Lamp, with and without gearing, and the regulating apparatus of the same. The Joblochkoff Candle, and the arrangement of the light apparatus. The Weston Lamp, the Serrin Lamp, Foucault's Lamp, Duboscq's Lamp, Archerean's Regulator, the Rapieff Electric Light in its various forms, the Regnier Electric Light, Reynier's Lamp, the Werdemann Electric Light, the Sawyer-Mann Electric Lamp, Fahrig's Burner, Directions for making a simple and effective Electric Lamp; Platinum Lamp, Figures illustrating carbon pencils as they appear under conditions varied by position and strength of current, Edison's Electric Light, and what is known of it up to the present time. SUPPLEMENT, No. **162**. Price 10 cents.

ELECTRICITY AS A MOTIVE POWER. By Prof. W. E. Ayrton. A careful review of the principles underlying the use of electricity as a motive power; comparing this power with that produced by steam, and showing by calculations and experiment that a dynamo-electric machine, with a separate exciter, driven very fast with a steam engine, or with a stream of water, at high or low pressure, and sending by even quite a fine wire a small current to a distant electro-motor, also running very fast and magnetized by a separate exciter, is an economic arrangement for the transmission of power, either for long or short distances. SUPPLEMENT, No. **198**. Price 10 cents.

SMALL ELECTRIC LOCOMOTIVE ENgine.—How to make, with dimensions and particulars. Illustrated by engravings. By G. F. Chutter. SUPPLEMENT **19**. Price 10 cents.

SOME OF THE MODIFICATIONS OF the Microphone and Telephone.—By George M. Hopkins. Practical instructions for making several new and greatly simplified forms of Microphones and Microtelephones. The several Microphones here described and illustrated are remarkably simple, easily constructed, inexpensive, and obviate most of the defects that accompany the ordinary forms of this instrument. These microphones used are transmitters, a Bell telephone being used as receiver. They are capable of performing the feats usually expected from microphones, such as transmitting the sound of the ticking of a watch, the tramp of a fly or ant, whistling, music, etc. Directions for making a new form of instrument fulfilling the requirements of both microphone and transmitting telephone, and capable of transmitting articulate speech as loudly and clearly as any of the well-known forms of telephone. It requires no call or alarm, as a loud sound made into the mouthpiece will produce a noise in the receiving instrument which may be heard in any part of a room of ordinary size. Full instructions for making an extremely simple and cheap microtelephone of entirely new form. The simple device here described, and which any one can easily construct, when placed on the table indicates in the receiving telephone the slightest touch on the table or on the instrument; in fact, it is capable of doing all done by other instruments of an analogous character. This article, illustrated with eight engravings, is contained in SUPPLEMENT **163**. Price 10 cents. The same number contains an article on "Simple Microphone," illustrated with one figure; a description of "Ducretet's New Stethoscopic Microphone," illustrated with one figure, and a description of "Varley's Musical Condenser," illustrated with one figure.

DYNAMO ELECTRIC MACHINES.—A *resume* of the recent important researches of M. Breguet into the theory of the Gramme Machine, whereby he has succeeded in clearing up a number of points which have hitherto been comparatively obscure in the operation of such apparatus, and some of which have been supposed irreconcilable with the accepted theory. Illustrated with twenty-two figures. Contained in SUPPLEMENTS **222, 224,** and **225**. Price 10 cents each.

THE FUTURE DEVELOPMENT OF Electrical Appliances.—By Prof. John B. Perry. An important and interesting discussion of the present status and the future prospects of electrical investigation. Electricity as a form of energy. Difference of potential. Electrical magnitudes. Rate of production of heat calculated in the shape of horse power. Transformation of electric energy into light and heat. Dynamo-machines. The electrical machines of the future. Distribution of electricity. Practical applications of the principles here discussed, which have a future before them. Illustrated with ten figures. Contained in SUPPLEMENT **283**. Price 10 cents.

TELEPHONES. ILLUSTRATED WITH Engravings.—*Preece's Improvements in Telephones*; describing, with aid of a diagram, the arrangement employed by this electrician for transmitting musical and other sounds according to his latest invention. *Edison's Recent Telephonic* Inventions: giving full description, illustrated by figures, of Edison's Microphone, Microphone with Carbon Disks, Microphone with Silk Disk, Voltaic Pile Telephone, Condenser Telephone, Carbon Telephone, Telephone arranged for office use, Single-Crown Telephone, and Double-Crown Telephone. A *New Form of Transmitting Telephone*, as devised by Mr. Edwd. H. Lyon; showing by description and engravings how the apparatus is constructed and how it is used. The *Watch Telephone* as devised by Mr. Alfred Niaudet-Breguet, the smallest kind of Bell telephone yet made; with description and illustration. All contained in SUPPLEMENT **163**. Price 10 cents.

TELEPHOTOGRAPHY.—DESCRIPTION of the apparatus devised by Mr. Shelford Bidwell, and by him successfully employed for transmitting pictures to a distance by telegraph. With seven cuts, giving general views and structural details of the transmitting and receiving instruments, and showing images as focused upon the transmitter and as reproduced by the receiver. Contained in SUPPLEMENT **280**. Price 10 cents.

THE TELECTROSCOPE.—BY M. SENlecq. Description in detail, accompanied by illustrations, of an apparatus intended to transmit to a distance, through a telegraphic wire, pictures taken on the plate of a camera. Contained in SUPPLEMENT **275**. Price 10 cents.

ELECTRICAL CLOCKS AND CLOCK Work. By Henry D. Gardner. Description and figures of the principal inventions that have been patented in electrical clocks and clockwork, embracing: Baine's Electrical Pendulum and Dials, Shepherd's System of lifting, by a current, a weight or spring for propelling a pendulum; Jones' Principle of controlling a number of indifferent clocks from one good one; Ritchie's ingenious modification of Jones' system; Dent's further improvements; Bain's plan of setting the hands of indifferent clocks by electricity; Collins' method of Correcting clocks; Ritchie's plan for correcting clocks by hourly currents; arrangement devised in the Great Westminster Clock for reporting its own time to Greenwich; E. J. Dent's method of driving an electric dial. 13 engravings. SUPPLEMENT, No. **198**. Price 10 cents.

THE BRUSH SYSTEM OF ELECTRIC Lighting.—An account of the workings of this interesting system, with detailed description of the Brush dynamo-electric machine and the Brush electric lamp. Illustrated with thirteen engravings. The same number contains another valuable paper on the same subject, by Charles F. Brush, M.E., descriptive of the Brush dynamo-electric machine and the lamps, showing the remarkable practical results that have been attained by their use. Contained in SUPPLEMENT **274**. Price 10 cents.

ARSENIC IN THE ARTS.—A LECTURE before the Medical Association of Central New York.—By S. A. Lattimore, LL.D., Professor of Chemistry in the Rochester University. A popular and important paper. SUPPLEMENT **29**. Price 10 cents.

BEET ROOT SUGAR MANUFACTURE. —By Edward L. Cull. A Method dispensing with Costly Outfit, and which may be tried with profit by Farmers. SUPPLEMENT **83**. Price 10 cents.

TELEPHONIC SYSTEMS OF DR. HERZ. —By Th. du Moncel. An account of the very remarkable Telephonic Experiments that have recently been made upon the different telegraph lines of France, and which are apparently destined to solve the problem of telephonic transmission over great distances. Illustrated with eleven engravings. Contained in SUPPLEMENT **274**. Price 10 cents.

ELECTRO-MAGNETIC RAILW'Y BRAKE of M. Achard, now in Use on the Northern Railway of France. Description of a very successful system of Powerful Continuous Brakes. SUPPLEMENT **111**. Price 10 cents. In the same number is an Instructive Paper on Fireless and Hot Water Locomotives.

ELECTRIC CANDLE.—BY W. LUCIEN Scarfe. Description of M. Jablochkoff's Candle, with an account of its Practical Operation, etc. SUPPLEMENT **108**. Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Electricity and Electric Apparatus.

GALVANIC BATTERIES.—A NEW AND valuable paper. By George M. Hopkins. Containing full instructions for the construction of nearly every known form of Battery, and its maintenance, comprised in three articles in SUPPLEMENTS **157, 158, 159.** Price 10 cents each. This paper includes all of the principal batteries used for Experiment, Telegraphy, Telephony, Electro-metallurgy, Electric Light, running Induction Coils, and other purposes. Also, Earth-batteries, Dry and Moist Piles, Simple batteries, costing only a few cents. Sulphate of Copper, Nitric, Chromic Acid, Quicksilver, Gas, Secondary, and Thermo-electric Batteries are included. It is the most comprehensive paper yet published on the subject. Illustrated with nearly Fifty Engravings.

ATMOSPHERIC ELECTRICITY. — BY David Brooks. A remarkably interesting paper, in which are brought together and explained the most prominent phenomena connected with the electricity of the atmosphere. How electricity is generated. The two theories held by scientists. Evidence that electricity is produced at the poles. The aurora borealis. The part played by thunderstorms. The part played by mountains. The curious phenomena of a thunderstorm. Waterspouts and whirlwinds. Lightning rods, and how they should be constructed. Oil tanks, how exploded by lightning; how they should be protected. Sheet lightning. Heat lightning. Contained in SUPPLEMENT **252.** Price 10 cents.

DYNAMO-ELECTRIC CURRENT: NEW Application.—An interesting review of two of the three most recent and important industrial applications of the electric current: 1. The fusion of refractory metals in considerable quantities by means of Siemens' electric furnace. 2. Dr. Siemens' successful experiments in the promotion of vegetation under the action of the electric light. Illustrated with two cuts. Contained in SUPPLEMENT **242.** Price 10 cents.

ILLUMINATION BY ELECTRICITY. BY J. Jarmin, de l'Academie des Sciences. How to Compare the Electric Arch to the Sun. The Electric Light Equal to the Sun. The Division of the Arch by the Alternative Currents of Le Roux. The Jablochkoff Candle. New and Remarkable Experimeni of Jablochkoff. The Condenser in Electric Illumination. The Perfect Light required to contain all the Colors. Simple Methods of Preventing the Bluish effect of the Electric Light. No Heat from the Electric Light. The Noise from the Electric Light. Cost. Faults heretofore in Electric Lighting. How to produce General, or Diffused Illumination. SUPPLEMENT **132.** Price 10 cents.

MICROPHONES AND TELEPHONES.—Recent Modifications and Improvements. Twelve engravings, with full directions for making and using. By Geo. M. Hopkins. Contained in SUPPLEMENT **163.** Price 10 cents. These Microphones are easily made and afford a world of amusement and instruction.

PRACTICAL SHORTHAND. — NEO-Phonography. A practical shorthand for everyday use. By James Richardson. A most excellent practical paper, containing full directions for the aquisition of Phonography, whereby any person of ordinary intelligence may instruct himself in the art of Phonographic writing, and acquire a fluent, easy method of recording human speech, delivered by the fastest speakers. The author has given the most ample directions for learners, with examples for practice. Given complete in SUPPLEMENT. **316.** Price only 10 cents. This is believed to be THE BEST as it certainly is the cheapest series of instructions in shorthand writing ever published.

VOSS'S INDUCTION ELECTRICAL Machine. — Description and illustration of the Holtz machine so modified by Voss as to give the apparatus features which render it of special value; the most important of these being its independence of atmospheric conditions. Contained in SUPPLEMENT **291.** Price 10 cents.

HOW TO MAKE INDUCTION COILS.—By George M. Hopkins. Practical instructions, with full working drawings to scale, sufficient to enable any person to make an efficient coil capable of giving 1½ spark, charging Leyden jars, decomposing water, lighting gas, exploding blasting cartridges, and it will exhibit the phenomena of electric light in vacuo. SUPPLEMENT **160.** Price 10 cents.

ELECTRICAL CABINET.—BY GEORGE M. Hopkins. Description of a simple, cheap, and easily constructed apparatus which the author calls an "Electrical Cabinet," and the parts of which, few in number, are ingeniously arranged so that they may be recombined in various ways to form several different pieces of apparatus to be used in performing a great variety of experiments. The Cabinet may be arranged to form an Electric Engine, a Magneto Machine, a Sounder, an Electric Bell, a Galvanometer, an Induction Coil, Electric Pendulum, etc. This cheap and effective apparatus has been devised for amateur experimenters, old and young, and with the aid of the working drawings and descriptions here given, may be very easily constructed by any one possessing the least mechanical ingenuity. Text illustrated with 14 engravings. SUPPLEMENT, No. **191.** Price 10 cts.

SIMPLE ELECTRIC LIGHT APPARATUS. By Geo. M. Hopkins. Two full-size Working Drawings for Easily Made Apparatus, and three drawings, showing all Details of Cells, and How to Arrange in Battery, with full instructions. Contained in SUPPLEMENT **149.** Price 10 cents.

THE TELEPHONE.—BY R. M. FERGUson, F.R.S. Read before the Royal Scottish Society of Arts. Its Construction, Uses, and Working fully and philosophically explained, with four illustrations. History of the Telephone. The Reis Telephone. Bell's Wonderful sensitiveness. Difference between the Galvanic and the Telephonic Impulse. A curious experiment. Theory of the Telephone. Molecular Vibrations of Metals. Magnetic Musical Sounds. Cause of the Sound. New Form of Telephone. SUPPLEMENT **120.** Price 10 cents. Also, in the same number, a Visit to the Inventor of the Phonograph. The Practical Uses of the Instrument in Cheaply reproducing Music. How the voice of the Prima Donna and the Elocutionist may be multiplied and preserved to all time. Usefulness of the Phonograph to the Blind, to Advocates, and others. Price of the Phonograph. An Improved Form, etc.

ON THE SPACE PROTECTED BY A Lightning Conductor An important contribution to electrical science by Mr. W. H. Preece, in which the author shows by the aid of diagrams the amount of space that will be protected by a lightning rod of any given dimensions. Illustrated with five figures. Contained in SUPPLEMENT **288.** Price 10 cents.

HOW TO MAKE A WORKING TELEphone.—By Geo. M. Hopkins. A valuable, practical paper, containing directions for construction of a cheap, simple Telephone. With Five Working Drawings, and View showing Line in Practical Operation. The Magnets, the Diaphragm, the Mouthpiece, and all parts clearly shown, with full Instructions How to Make the Magnets, size and arrangement of Wire, etc. Contained in SUPPLEMENT **142.** Price 10 cents.

TELEPHONE CALLS.—BY GEORGE M. Hopkins. Plain and complete practical directions for making an excellent although inexpensive signaling apparatus, working without a battery, and which, in the modified form here described, is so simplified that one bell and two magnets are dispensed with. Full directions also for making an alarm to be used with a battery and a closed circuit. By the aid of the minute descriptions, and the 6 scale drawings herein given, any one can construct a very efficient telephone call of either of the above kinds, which may be used in connection with any of the telephones employing permanent magnets, and which will answer well for rooms where the noise is not great. SUPPLEMENT, No. **162.** The same number contains a description (illustrated) of the Lorenz Telephone Call and also a description (illustrated with 2 engravings) of the Call Bell and Morse Combination for telephone lines. Price 10 cents.

THE TRANSMISSION OF POWER BY Electricity.—By N. S. Keith. Demonstrating the possibility of utilizing the power of waterfalls, etc., at long distances. Careful electrical computations, descriptions of necessary apparatus, and cost. SUPPLEMENT **87.** Price 10 cents.

LIGHTING BY ELECTRICITY. BY Robert Briggs, C.E. The Lamps, Magneto-electric Machines, and other apparatus now used at the Railway Station at La Chapelle, Paris. Practical Running and Cost of the system; Perfect Illumination at half the cost of Gas, and other advantages. Pixii's, Saxton's, Clarke's, Siemens and Halske's, Wheatstone's, Nollet's, Alliance, Holmes', Wild 's, and Gramme Magneto-Electric Machines. The Serrin and other Lamps. Jablochkoff's Candles. Experiments in Electric Illumination. Contained in SUPPLEMENTS **98, 99.** The Electric Illumination of MM. Sautter & Lemonnier's Workshops, Paris, with cost, and one illustration, in SUPPLEMENT **38.** A description of Jablochkoff's Electric Candle. SUPPLEMENTS **78, 108.** Price 10 cents each.

MAGNETIC REACTIONS. — BY THEO. du Moncel. An interesting and instructive paper, by one of the most eminent French electricians, demonstrating that the effects of magnetism, like those of electricity, are of two different natures, according as magnets act as currents or as charges in the static state. Static action and dynamic action defined. How static magnetism is distributed in a simple magnetic system shown by magnetic phantoms. The effects which result from reactions exchanged between a magnet and its armature. Apparatus for showing this. Magnetism, from a static point of view, shown to behave like electricity in a condenser Magnetic condensation. Remanent Magnetism, and how it differs from Condensed Magnetism. Illustrated with eleven figures. Contained in SUPPLEMENT **217.** Price 10 cents.

LIGHTNING CONDUCTORS.—BY RICHard Anderson, F.C.S., F.G.S.—A paper read before the British Association, showing from numerous recorded accidents that it is not sufficient merely that lightning rods should be erected, but that they should be regularly inspected to see if they are at all times in good order so as to be really efficacious, and pointing out that it is from a failure of such inspection that accidents occur in places nominally protected by conductors. Contained in SUPPLEMENT **249.** Price 10 cents. The same number contains a valuable article by Wm. H. Preece, on "*The Proper Form of Lightning Conductors.*"

PRACTICAL USES OF ELECTRICITY.—By Prof. Charles A. Young. An interesting essay, in which the author discusses, in an untechnical manner, the extent and variety of the existing applications of electricity to the arts of life, and the reasons for expecting their rapid multiplication in the near future. The telegraph and telephone. Electric alarms. Transmission of time by electricity. Electricity in the management of explosives. Electroplating. Dynamo machines. Electric light. Electro-magnetic engines. Electric railways. Plowing by electricity. Electric pile drivers. Electricity in medicine and surgery. Contained in SUPPLEMENT **285.** Price 10 cents.

SIMPLE HOLTZ ELECTRICAL MAchine, with experiments in static electricity.—By Geo. M. Hopkins. Description of construction of several simplified forms of the Holtz electrical machine, with working drawings, to enable any one at slight expense to make a single or double plate apparatus. Accompanied by descriptions of a large number of highly interesting and instructive experiments in static electricity which may be performed with this machine, with directions for the application of static electricity in the cure of disease. Illustrated with seventy engravings. Contained in SUPPLEMENTS **278, 279,** and **282.** Price 10 cents each, or 30 cents for the set.

THE BLAKE TRANSMITTER.—AN EXplanation of the more obscure parts of the microphone, and of the method of showing its faults, when such exist in it, and also of the method of locating the faulty spot. Description of microphone. How to put up new microphones. How to discover faults and how to remedy them. How to adjust. Contained in SUPPLEMENT **250.** Price 10 cents.

THE ELECTRIC LIGHT.—A PAPER containing a detailed description of the principal Electric Lamps of recent date, including the Edison, Sawyer-Man, Wallace-Farmer, Brush, Maxim, Jablochkoff, Rapieff, Reynier, and several others—with over 20 engravings. In SUPPLEMENT **162.** Price 10 cents.

THE GRAMME MAGNETO-ELECTRIC Machines. With working drawings, dimensions, and particulars of construction. By M. Tresca. SUPPLEMENT **17.** Price 10 cents.

TELEPHONE CALL, HOW TO MAKE.—By George M. Hopkins. Complete working drawings and instructions for making the magneto Call. Also, directions for making several other simple Telephone Calls. SUPPLEMENT **162.** Price 10 cents.

EXPERIMENTS WITH THE INDUCtion Coil. By George M. Hopkins. A description of many interesting and beautiful experiments which may be performed with the induction coil, and which exhibit the phenomena peculiar to the secondary current. Illustrated with 15 engravings. Experiments to show the Path of the Electric Spark over Mica; the Rotating Disk; Experiments with the Leyden Jar; the Fulminating Pane; the Gas Pistol; Stateham's Fuse; the Decomposition of Water, and the Apparatus for Effecting it; Geissler's Tubes; Geissler's Tubes showing Magnificent Striæ; Luminous Points shown by Bell Glass; Experiments with the Electric Egg; the apparatus for showing the beautiful experiment known as Gassiot's Cascade. SUPPLEMENT, No. **166.** Price 10 cents.

THE MICROPHONE. — INTERESTING Description, by W. J. Lancaster, F.R.S. 3 Figures. Use of the Instrument in Medicine. How to Make a Most Simple and Entertaining Instrument. Curious Experiments. SUPPLEMENT **137.** Price 10 cents. Also, in same number, A New Mercury Telephone; the Phoneidoscope and the Phonoscope; Reynier's Electric Lamp; Color Blindness, etc.

ELECTRICAL MACHINES.—AN IMportant Problem and its Solution.—By Theodore Wiesendangir. A review of the progress lately made in the production of dynamo-generators and electro-motors for industrial purposes; a discussion of the points wherein they are as yet inefficient; and a description of an electro-motive apparatus recently devised by the author, in which some important difficulties are overcome. Illustrated with eight figures. Contained in SUPPLEMENT **253.** Price 10 cents.

THE HUGHES TELEPHONE. SIX FIGures. Sound converted into Undulatory Electrical Currents by Unhomogeneous Conducting Substances in Circuit. The Simplest Telephone and the most sensitive Acoustical Instrument yet constructed. Instrument for Testing the effect of Pressure on Various Substances. Interesting Experiments which may be performed by any person with a few nails, pieces of sealing wax, a glass tube containing powders, and a few sticks of charcoal. Contained in SUPPLEMENT **128.** Price 10 cents.

THE INDUCTION BALANCE AND SONometer.—By Geo. M. Hopkins. Plain directions for making the simple yet wonderful apparatus devised by Prof. Hughes, and called indifferently the "Sonometer" or "Audiometer." With these directions and the accompanying 6 figures in perspective and in detail, any one with a little mechanical ingenuity and at a trifling cost can construct for himself an instrument that will yield him a world of interest and amusement. SUPPLEMENT, No. **196.** Price 10 cents.

SMALL ELECTRIC LIGHTS FROM BATteries. An article showing the cost of the production of the Electric Light by the use of various batteries, as the Faure, Thomson, Bichromate of Potash, Le Gourant De Tromelin, and Rotary, and demonstrating, from the expense thus ascertained, the superiority of machines over batteries from the point of view of cost of working. SUPPLEMENT, No. **195.** Price 10 cents

ELECTRO-MAGNETS.—BY GEORGE M. Hopkins. An explanation of the principles which underlie the construction and operation of electro-magnets, and which, when not thoroughly understood, often puzzle the tyro; showing in addition, how the apparatus is constructed, how the armatures are arranged, and illustrated with 49 figures exhibiting the various forms of electro-magnets generally used for electrical purposes. This paper is especially valuable to those who wish to construct their own apparatus. SUPPLEMENT, No. **182.** Price 10 cents.

NEW ASTATIC GALVANOMETER.—BY Marcel Deprez. With one cut. SUPPLEMENT **308.** Price 10 cents.

THE ELECTRIC DISCHARGE THROUGH Colza Oil.—By A. MacFarlane, D.Sc. SUPPLEMENT **308.** Price 10 cents.

ELECTRIC LIGHTNING BY INCANdescence.—By J. Swan. SUPPLEMENT **307.** Price 10 cents.

MAGNETO-ELECTRIC AND DYNAMOElectric Machines in the International Electrical Exhibition at Paris. SUPPLEMENT **307.** Price 10 cents.

HISTORY OF TELEGRAPHY.—SUPPLEMENT **307.** Price 10 cents.

HOW TO MAKE TELETHERMOMETERS. —By E. Rousseau. With two figures. SUPPLEMENT **307.** Price 10 cents.

NEW CONTINUOUS CURRENT DYNAmo-Electric Machine of Hefner-Alteneck.—Full description, with five figures. SUPPLEMENT **296.** Price 10 cents.

ACTION OF LIGHTNING UPON TELEphone Apparatus. SUPPLEMENT **301.** Price 10 cents.

ELECTROLYTIC DETERMINATIONS and Separations.—By Alex. Classen and M. A. Von Reis. SUPPLEMENT **299.** Price 10 cents.

ECONOMY OF ELECTRIC LIGHT.—By W. H, Preece. SUPPLEMENT **288.** Price 10 cents.

CHEMICAL ENERGY AND ELECTROmotive Force of Different Galvanic Combinations. —By Julius Thomsen. Tables showing Galvanic Combination. Chemical reaction. Corresponding production of heat and energy of combination in 9 well-known forms of batteries. SUPPLEMENT **279.** Price 10 cents.

LAYING AND REPAIRING SUBMArine Telegraph Cables.—By Andrew Jamieson, C.E. With four figures. SUPPLEMENT **280.** Price 10 cents.

GALVANOMETER, DEPREZ & D'ARsonval's Astatic.—Illustrated. By Marcel Deprez. SUPPLEMENT **308.** Price 10 cents.

NEW CURRENT OF INDUCTION ELEtricity.—New method of producing electrical nerve and muscle reaction. Illustrated. By William J. Morton, M.D. SUPPLEMENT **302.** Price 10 cents.

ELECTRICAL HORTICULTURE. — BY C. Wm. Siemens. SUPPLEMENT **304.** Price 10 cents.

ACTION OF LIGHTNING ON TELEphone Apparatus.—SUPPLEMENT **301.** Price 10 cents.

HISTORY OF TELEGRAPHY. — SUPPLEMENT **307.** Price 10 cents.

TEMPERATURE OF THE ELECTRIC Light.—By F. Rosetti. SUPPLEMENT **279.** Price 10 cents.

ELECTRO-CHEMICAL ANALYSIS OF Metals.—With one figure. SUPPLEMENT **265.** Price 10 cents.

DYNAMO-ELECTRIC, CONTINUOUS Current of Hefner-Alteneck.—Illustrated. SUPPLEMENT **296.** Price 10 cents.

MAGNETO-ELECTRIC AND DYNAMOElectric Machines at the Paris Electrical Exhibition.—SUPPLEMENT **307.** Price 10 cents.

ELECTRIC LIGHTING BY INCANDEScence.—By J. Swan. SUPPLEMENT **307.** Price 10 cents.

ELECTROLYTIC DETERMINATIONS and Separations. By A. Classen and A. Von Reis. SUPPLEMENT **299.** Price 10 cents.

ELECTRICAL HORTICULTURE.—BY C. W. Siemens, D.C.L., F.R.S. SUPPLEMENT **304.** Price 10 cents.

OPERATIONS OF THE BRITISH POST Office. Letters. Parcel Post. Telegraphs. Telephones. Savings Banks. Postal Orders. Revenue. SUPPLEMENT **302.** Price 10 cents.

TELE-PHOTOGRAPHY. — TRANSMISmission of pictures to a distance. By Shelford Bidwell. With four figures. SUPPLEMENT **299.** Price 10 cents.

ELECTRO-BRASSING AND BRONZING —By Alex. Watt. SUPPLEMENT **164.** Price 10 cents.

ELECTRO - GILDING. — SUPPLEMENT **160** Price 10 cents.

ACTUAL COSTS OF USING ELECTRIC Lights.—By T. H. Shoolbred. SUPPLEMENT **158.** Price 10 cents.

A CERTAIN MEANS OF MEASURING and Regulating Electric Currents.—By C. W. Siemens, D.C.L., F.R.S. SUPPLEMENT **171.** Price 10 cents.

A SIMPLE ELECTRIC PEN: HOW TO Make. SUPPLEMENT **166.** Price 10 cents.

HERRING'S PRINTING TELEGRAPH. With illustrations of alphabet. SUPPLEMENT **164.** Price 10 cents.

AUTOGRAPHIC TELEGRAPHY.—DEscription of Mr. D'Arlincourt's apparatus for transmitting telegrams in the hand-writing of the sender. With one figure. SUPPLEMENT **166.** Price 10 cents.

ELECTRO-DEPOSITION OF NICKEL.—Weston's new process, by means of which a beautiful, white, ductile product is obtained. SUPPLEMENT **192.** Price 10 cents.

NEW THERMO-ELECTRIC BATTERY.—Description of Mr. Sudre's apparatus. With ten figures. SUPPLEMENT **195.** Price 10 cents.

PERMANENT MAGNETS. — HOW TO make them. The various methods of magnetizing steel. The kind of steel to be used. Kind of current used. The time required, etc. A thoroughly practical article. SUPPLEMENT **318.** Price 10 cents.

NEW KALEIDOSCOPE.—DESCRIPTION of a greatly improved form of the apparatus. With cuts showing details of construction. SUPPLEMENT **197.** Price 10 cents.

REMOVAL OF HAIR BY ELECTRICITY —By George H. Fox, M.D. SUPPLEMENT **176.** Price 10 cents.

ON SIMPLE FORMS OF MICROPHONE Receivers.—By J. Millar, C.E. With five cuts. SUPPLEMENT **178,** Price 10 cents.

THE MIRROR OF JAPAN AND ITS Magic Quality.—By Prof. W E. Ayrton. With one cut. SUPPLEMENT **179.** Price 10 cents.

A NEW CATADIOPTRIC TELESCOPE. —With one figure. SUPPLEMENT **184.** Price 10 cents.

A NEW KIND OF TELEGRAPH CABLE. —SUPPLEMENT **175.** Price 10 cents.

TELESCOPIC AND STEREOSCOPIC Vision; Facts in regard to.—By H. Farrard, C.E. SUPPLEMENT **169.** Price 10 cents.

DYNAMO — ELECTRIC MACHINES.—By Prof. E. J. Houston & Elihu Thomson. A study of some of the interesting circumstances which influence the efficiency of these apparatus. SUPPLEMENT **170.** Price 10 cents.

NEW DEVICE FOR MAGNETIZING Compass Needles.—SUPPLEMENT **170.** Price 10 cents.

NEW DUPLEX SYSTEM OF TELEgraphy By S. M. Banker. With one cut. SUPPLEMENT **172.** Price 10 cents.

DEPREZ'S ELECTRIC MOTOR.—WITH one cut. SUPPLEMENT **212.** Price 10 cents.

THE LONTIN SYSTEM OF ELECTRIC Lighting.—With four figures. SUPPLEMENT **213.** Price 10 cents.

A SYSTEM OF ELECTRICAL STORAGE. —By Profs. E. J. Houston and Elihu Thomson. With two figures. SUPPLEMENT **215.** Price 10 cents.

ELECTROTYPING NON-CONDUCTING Materials: New process for. SUPPLEMENT **224.** Price 10 cents.

A NICKEL BATTERY —DESCRIPTION and illustrations of new apparatus devised by Mr. T. Slater. SUPPLEMENT **210.** Price 10 cents.

POCKET TELEMETER.—DESCRIPTION and illustration of a new and convenient apparatus devised by Capt. Gaumet for measuring distances to inaccessible points. SUPPLEMENT **207.** Price 10 cents.

REDUCTION OF OLD SILVER BATHS by Electricity. By H. Stone. With one cut. SUPPLEMENT **260.** Price 10 cents.

TROUVE'S ELECTRIC MOTOR AND ITS Applications. SUPPLEMENT **259.** Price 10 cents.

INTERESTING FACTS ABOUT ELECtricity and Gas. By Dr. Siemens. SUPPLEMENT **259.** Price 10 cents.

THE HELIOGRAPH. — DESCRIPTION of an improved sun telegraph. By Tempist Anderson, M.D. With one figure. SUPPLEMENT **253.** Price 10 cents.

INTERESTING ELECTRICAL REsearches. SUPPLEMENT **275.** Price 10 cents.

A SIMPLE TRANSMISSION DYNAmometer. By Elihu Thomson. SUPPLEMENT **272.** Price 10 cents.

SOUND FROM RADIANT ENERGY.—By W. H. Preece. SUPPLEMENT **270.** Price 10 cents.

ELECTRIC DRAWING APPARATUS for obtaining autographic stencil, of writings and designs capable of being reproduced by lithography, or upon metals by the acid-graving process. With one cut. SUPPLEMENT **197.** Price 10 cents.

THE NATURAL ENEMIES OF THE TELephone.—By T. D. Lockwood. SUPPLEMENT **267.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Physical Investigation and Apparatus.

EXPERIMENTS IN ACOUSTICS. — A valuable paper containing accounts of an interesting series of acoustical experiments made by Mr. A. C. Engert, to show how sound may be propagated and improved by the use of steel plates and wires, and the principle involved in which is believed to be capable of development and application to the improvement of sound in buildings not properly planned for that purpose. The system has the advantage of simplicity and readiness of application; it is not cumbersome or unsightly, and need not interfere with architectural arrangements. Contained in SUPPLEMENT **247**. Price 10 cents.

HEAT IN RELATION TO CHEMICAL Action.—By Henry Allen. A review of some of the results that have recently been obtained by experimenters in the branch of physics known as thermo-chemistry. Description of apparatus used by M. Berthelot in his calorimetric determinations. The fundamental principles of thermo-chemistry explained. Decomposition of water by metals. Action of hydrochloric acid. Sulphides. Nitric acid. Contained in SUPPLEMENT **291.** Price 10 cents.

EKOWE POCKET HELIOGRAPH, Major Macgregor's. Description and Diagrams of an exceedingly cheap, portable, easily constructed heliograph, which is not liable to get out of order, and which has been found peculiarly effective for the purposes for whic designed—sending signals to a distance by the solar rays. Illustrated with two figures. Contained in SUPPLEMENT **258**. Price 10 cents.

CAPILLARITY.—BY GEO. H. STONE, A.M. An interesting lecture wherein the author makes the subject of capillarity clear by means of simple experiments and explanations without resorting to the higher mathematics. Contained in SUPPLEMENT **238.** Price 10 cents.

HEAT AND LIGHT. — BY ROBERT Ward.—An able and interesting review of some of the former and present theories of scientists to account for the production of heat and light; with comments by the author on a few of the fallacies on which such theories have been founded. Contained in SUPPLEMENT **259.** Price 10 cents.

WATER IN STEAM.—BY PALAMEDE Guzzi, C.E. Measurement of the Water Mechanically Suspended in Steam, with two figures. What has been done, with full description of a New Improved Apparatus. *Measurement of Water Mechanically Suspended in Steam.* By J. B. Knight. Description of Improved Apparatus, and Method of Operating. SUPPLEMENT **114.** Price 10 cents.

THE FLOW OF SOLIDS.—BY LEWIS S. Ware, C.E. Novel and Curious experiments. Cold metal caused to flow through orifices, and the laws governing such flow, with mathematical calculations, and 13 illustrations. SUPPLEMENT **82.** Price 10 cents.

THE FLEXIBILITY OF MARBLE.—With one figure. SUPPLEMENT **308.** Price 10 cents.

INSTRUMENT FOR TESTING LIGHTning Rods.—Illustrated. SUPPLEMENT **296**. Price 10 cents.

OXYGEN FROM ATMOSPHERIC AIR.—Illustrated. SUPPLEMENT **300.** Price 10 cents.

PHENOMENA DEVELOPED BY HELIOstatic Star Disks.—By G. W. Royston-Pigott. Illustrated. SUPPLEMENT **310.** Price 10 cents.

PHYSICS WITHOUT APPARATUS.—Lifting with the fingers. Illustrated. SUPPLEMENT **302.** Price 10 cents.

SPRENGEL-PUMP.—ESSAY ON A method of obtaining and measuring very high vacua with a modified form of Sprengel-Pump. Illustrated. By Ogden N. Rood, Professor of Physics, Columbia College. SUPPLEMENT **303.** Price 10 cents.

DOUBLE ACTION MERCURIAL AIR Pump.—With one figure SUPPLEMENT **289.** Price 10 cents.

HOT ICE; EXPERIMENTS WITH—BY J. B. Hannay. With five figures. SUPPLEMENT **289.** Price 10 cents.

ON HEAT GENERATED IN A MAGNET when it is Magnetized and Demagnetized. By Prof. Henry A. Rowland. SUPPLEMENT **305.** Price 10 cents.

AIR THERMOMETERS.—BY E. ROUSseau. Illustrated. SUPPLEMENT **307.** Price 10 cents.

TELELOGUE, CAPT. GAUMET'S NEW Apparatus for Optical Telegraphy.—Illustrated. SUPPLEMENT **308.** Price 10 cents.

COMPRESSED AIR CLOCKS.—DESCRIPtion of the system of pneumatic clocks lately inaugurated in Paris. With five figures. SUPPLEMENT **293.** Price 10 cents.

COMPRESSED AIR CLOCK.—SUPPLEMENT **293.** Price 10 cents.

HOW TO MAKE A SIMPLE EQUATORial.—By E. Lasant. SUPPLEMENT **291.** Price 10 cents.

A SIMPLE, RAPID FILTERING, APPAratus.—By V. F. Davenport, M.D. With two figures. SUPPLEMENT **281.** Price 10 cents.

PLATEAU'S FILMS.—A PAPER DEscribing some interesting experiments with "Plateau's Flms," a subject of physics almost ignored in text-books. Illustrated with fifteen cuts. SUPPLEMENT **160.** Price 10 cents.

THE REMOVAL OF WIRE AND IRON from Wheat by Magnets.—With eight cuts. SUPPLEMENT **175**. Price 10 cents.

PHYSICAL PROPERTIES OF THE atmosphere.—SUPPLEMENT **157**. Price 10 cents.

THERMOMETERS. — BY R. J. MANN. The common thermometer, and how made. Sensitive, Maximum, Minimum, and Registering Thermometers. Radiation Thermometers; Clock Register Thermometers; Deep-sea Thermometers; Self-moving and Registering Thermometers. The uses to which the Thermometer is put, etc. SUPPLEMENT **59.** Price 10 cents.

PHYSICAL SCIENCE IN OUR COMMON Schools.—An able paper by Prof. Clarence M. Boutelle, of the State Normal School of Wisconsin, in which the author strongly advocates the teaching of physical science by the experimental method in all schools, even the most elementary, and outlines a method of such teaching and shows the results to be obtained therefrom. Contained in SUPPLEMENT **286.** Price 10 cents

RONCALLI'S MELOGRAPH.—DESCRIPtion and illustration of an apparatus for recording musical notes when playing. Contained in SUPPLEMENT **274.** Price 10 cents.

THE FLOW OF METALS.—BY DAVID Townsend. Valuable experiments, with ten engs., on Punching through thick plates. Evidences of a Flow of Metal. Effect of Flow on Dimensions, Density, etc., of Plate. Lines of Least Resistance, etc. Punching with and across the grain. Practical add ications. SUPPLEMENT **119.** Price 10 cents.

THE PHOTOPHONE. — DESCRIPTION by Prof. Alex. Graham Bell of the new apparatus (Photophone) for the production and reproduction of sound by means of light, and explanation of the principle involved therein. Selenium and its properties. Experiments with selenium. Experiment with light as a producer of sound. Researches by Messrs. Tainter and Bell on the resistance of crystalline selenium within manageable limits. Photophonic transmitters. Arrangement of apparatus for the reproduction of sound by light. Non-electric photophone receivers. Contained in SUPPLEMENT **246.** Price 10 cents.

PRODUCTION OF SOUND BY RADIANT Energy.—An important contribution to Physical Science by Alexander Graham Bell, wherein the author describes in detail the most recent researches of himself and Mr. Sumner Tainter on the action of radiant energy upo various solids liquids, and gases; and also their experiments upon substitutes for selenium in electrical receivers, upon the measuremeut of the sonorous effects produced by different substances, and upon the nature of the rays that produce sonorous effects. accompanied by fourteen figures illustrative of apparatus used. Contained in SUPPLEMENT **281.** Price 10 cents.

NEWTONIAN TELESCOPE FOR AMAteurs.—Description of an excellent Portable Telescope designed specially to meet the wants of Amateur Astronomers. With the aid of a screwdriver and other simple tools, any one, by following the directions here given, can construct for himself, at the cost of a few dollars only, an instrument capable of performing most of the work done by telescopes of high price. The body of the instrument is constructed on the lattice principle, need not weigh over four pounds, is thus well adapted for moving in and out of doors easily, and takes but little space to store it. Illustrated with one engraving. Contained in SUPPLEMENT **179.** Price 10 cents.

A SIMPLE MERCURIAL AIR-PUMP.—By Geo. M. Hopkins. Description of an easily constructed and inexpensive Sprengel and Geissler air-pump, which may be used for all purposes of experimentation in place of the ordinary pump. With the description and figures here given any one can easily make this apparatus for himself, the materials being few and cheap, and no glass-blowing being required. Illustrated with ten explanatory figures. Contained in SUPPLEMENT **224.** Price 10 cents.

THEORY OF THE PHOTOPHONE.—Abstract of a paper by Mr. W. H. Preece, wherein is described a series of experiments undertaken by him to determine whether the cause of the photophonic phenomena discovered by Messrs. Bell and Tainter was due to light or heat, with results of investigation. Illustrated with six figures. Contained in SUPPLEMENT **283.** Price 10 cents.

METHOD OF OBTAINING AND MEAsuring very High Vacua with a modified form of Sprengel Pump.—A paper by Prof. Ogden N. Rood, describing a modified form of Sprengel Pump devised by him, which is simple in construction, inexpensive, easy of manipulation, and with which he has obtained vacua as high as one three hundred-and-ninety-millionth of an atmosphere. Details of Construction. Method of Manipulation. Calculations. Results obtained. Contained in SUPPLEMENT **303.** Price 10 cents.

HOT ICE.—BY PROF. THOMAS CARnelley. A detailed description of experiments proving that, under certain conditions, it is possible for ice to exist in the solid state at temperatures far above their ordinary melting points. The bodies discussed in this paper are ice and mercuric chloride. Contained in SUPPLEMENT **271**. Price 10 cents.

ON SOME PHYSICAL PHENOMENA.—By W. J. Millar. An interesting discussion of the properties and nature of certain manifestations that are brought prominently before us in studying our physical surroundings: Force; Matter; Motion; Space; Time; Momentum; Velocity; Energy. Contained in SUPPLEMENT **272.** Price 10 cents.

THE PHONOGRAPH. — LECTURE BY Prof. J. W. S. Arnold. What Sound is. Music and Noise. Construction of the Ear, and How we Hear. Vocal Sounds made Visible. The Lissajous Curves. Construction of the Phonograph, with Five Figures. SUPPLEMENT **119.** Price 10 cents.

ACTION OF AN INTERMITTENT Beam of Radiant Heat upon Gaseous Matter.—By John Tyndall. An interesting communication recently presented by this eminent investigator to the Royal Society, wherein he brings to notice a novel mode of testing the relations of radiant heat to gaseous matter, whereby singularly instructive effects have been obtained. Contained in SUPPLEMENT **272**. Price 10 cents.

RELATION BETWEEN ELECTRICITY and Light.—A lecture delivered at the London Institution by Dr. O. J. Lodge, in which the author discusses carefully, and in an interesting manner, a few of the typical and most salient points in the relation between electricity and light. Contained in SUPPLEMENT **275.** Price 10 cents. The same number contains an article on some "Interesting Electrical Researches."

SPECTRUM ANALYSIS APPLIED TO the Solar System.—A very instructive lecture by Dr. William Huggins, giving an exceedingly interesting *résumé* of the results which have been obtained in recent years by a study of the stars through spectrum analysis. Contained in SUPPLEMENT **281**. Price 10 cents.

THE WONDERS OF LIGHT. — AN INteresting lecture recently delivered before the Society of Arts, by W. H. Preece. Showing the Theory of Light, Separation of White Light into Colors. The New Luminous Paint. Artificial Lights; Candle Light; Oil Light; and brief history of Gas Light. Heat and Light identical. Electrical Light. Electrical Light and Gas Light compared. Contained in SUPPLEMENT **225.** Price 10 cents.

THE PHENOMENA OF FLUORESCENE. —By Edward R. Hodges. Contained in SUPPLEMENT **255**. Price 10 cents.

THE PHOTOPHONE.—AN INTERESTing account of the experiments, some years ago, of Mr. Willoughby Smith with the substance Selenium and the discovery by him of the influence of light thereon. An important series of researches which led subsequently to the development by Messrs. Bell and Tainter of an entirely new branch of philosophical inquiry—Photophonic Science. An important contribution to the history of the Photophone. Illustrated with four figures. Contained in SUPPLEMENT **270.** Price 10 cents. The same number contains an abstract of a paper by W. H. Preece, on "Sound from Radiant Energy."

THE VISCOSITY OF GASES AT HIGH Exhaustions. By William Crookes, F.R.S.—Abstract of a paper read before the Royal Society, wherein the author describes an elaborate series of experiments undertaken by him to ascertain the amount of viscosity or internal friction possessed by various gases in high vacua. The following topics are discussed: The viscosity of air; of oxygen; of nitrogen; of carbonic anhydride; of carbonic oxide; and of hydrogen. The spectrum of hydrogen. Influence of aqueous vapor on the viscosity of air. Discussion of results. The ultra-gaseous state of matter. Contained in SUPPLEMENT **277**. Price 10 cents.

ON THE MEASUREMENTS OF THE Lengths of the Waves of Light, preceded by short accounts of the Undulatory Theory of Light, and of the Phenomena of Diffraction and Interference of Light.—By Alfred M. Mayer. Theories that have been put forth in regard to light. The undulatvry theory and facts out of which it has been wooen. Experiment to show that one series of sonorous vibrations meeting another series cause silence at their place of meeting. Philosophers led to seek for similar actions in the phenomena of light. The celebrated experiment of Fresnel on interference of light described and explained. Huyghen's explanation of the manner in which the waves of ether, causing light, are propagated. Description and explanation of the phenomenon of diffraction of light. The various curious phenomena connected with the diffraction of light, and an explanation of them. The method of measuring the lengths of the different waves of light which cause in the eye the sensation of color. Spectra and Fraunhofer lines as viewed through the diffraction grating. Description of the Spectrometer. The action of a grating on a beam of light traversing it explained. How the waves of light are measured with a grating and a spectrometer. Mascart's improvement in the process of measuring wave lengths Table of wave lengths of the principal Fraunhofer lines of the solar spectrum. Description of Rutherfurd's ruling-engine for cutting diffraction gratings, with twelve figures illustrating apparatus and experiments. Contained in SUPPLEMENTS **175** and **177**. Price 10 cents each.

CLASSIFICATION OF THE VARIOUS Forms of Energy.—By Dr. O. J. Lodge. A paper of importance to those interested in the science of Physics. Ably treated under the following headings. 1. Newton's Third Law. 2. Definition of Work, + and —. 3. Denial of "Action at a Distance." 4. Definition of Energy. 5. Definition of Working Power. 6. Conservation of Energy, and First Law of Thermo-dynamics. 7. Possibility of Various forms of Energy. 8. Classification of the Forms of Energy. 9. The Fundamental Forms of Energy. 10. Kinetic and Potential Energy related to the two Factors in the Product Work. 11. Transformation from one Form to another. 12. Further Subdivision of the Forms of Energy. 13. Classification Table. 14. Distinction between Energy and Entropy. 15. Distinction between Available and Unavailable Energy and Useful and Useless Work. 16. Reason why the Energy of Ordinary Masses is Available, and 17. Why Planetary Energy is Unavailable. 18. Reasons why Molecular Energy is much of it Unavailable. 19. Extent of Availability of Atomic and Electrical Energy. 20. Dissipation of Energy. Contained in SUPPLEMENT **208.** Price 10 cents.

OPTICAL TELEGRAPHY. — DESCRIPtions of several of the most approved methods employed by armies in recent years in the transmission of telegrams by flashes of light. The simplest form of an optical telegraph. Leseurre's Heliotelegraph. Col. Mangin's Optical Telegraph. The Day and Night Optical Telegraph. Fixed Apparatus. Advantages. Illustrated with three figures of apparatus. Contained in SUPPLEMENT **284.** Price 10 cents.

SPECTRUM ANALYSIS. BY PROF. Redwood. A highly interesting lecture, recently delivered before the Pharmaceutical Society of Great Britain. Explaining the propagation of Light and the properties of Ether. Giving lengths of Light-waves and showing the cause of Refraction. The Theory of Color, and how the Spectrum is accounted for. The characteristic Spectra of the several Metals and the Method of Analyzing by the Spectrum. SUPPLEMENT **79.** Price 10 cents.

FAST PASSENGER LOCOMOTIVE.—Two figures and details of construction of the fast passenger locomotive (runs seventy-five miles an hour), with a single pair of driving wheels 6 ft. 6 in. in diameter, recently built for the Bound Brook line between New York and Philadelphia, which from its efficiency has attracted great attention. Contained in SUPPLEMENT **231.** Price 10 cents.

THE ORIGIN OF FALLING MOTION.—By Charles Morris. An interesting study of the form of energy which creates motion. Its origin in the moving bodies themselves as real motion, existing previously in some other form, and converted as needed into the form of mass motion. The various modifications of motive energies which exist as constituent forces of all matter. Electrical, magnetic, chemical, cohesive, and temperate energies; their specialized and generalized forms. Heat force. Gravitative energy. Transformation of heat motion in falling bodies. Loss of mass motion followed by increase of temperature. Interesting deductions made from applying the ideas herein given to the movement of planetary bodies. Attraction of gravitation not a creator of motion, but its influence only directive. Contained in SUPPLEMENT **240.** Price 10 cents.

SONOROUS VIBRATIONS, PRESENTAtion of, by means of a revolving lantern.—By Henry Carmichael. Description of an improved apparatus devised and successfully used by the author in exhibiting, by means of a sensitive flame, the pitch, intensity, and quality of sound waves from the voice or from bodies in sonorous vibration. Illustrated with five figures. Contained in SUPPLEMENT **254.** Price 10 cents.

NEW ENLARGING LENS FOR MAGIC Lantern.—By J. H. Dallmeyer, F.R.A.S. Description of a new and improved lantern lens, having all the essentials of a perfect objective, and also of the best form of condenser for exhibition purposes by the public lecturer, preceded by some valuable hints on the best modes of illumination. Illustrated with four figures. Contained in SUPPLEMENT **236.** Price 10 cents.

VORTEX MOTION.—BY PROF. O. REYnolds.—A Lecture delivered at the Royal Institution. New Principle of Fluid Motion, and How Discovered. Characteristics of Smoke Rings, Eddies in Water, etc., and their Mathematical Relations. Nautical and other Applications, etc., with Beautiful Experiments. SUPPLEMENT **85.** Price 10 cents.

WAVE-MOTION.—BY PROF. OSBORNE Reynolds, F.R.S. Read before the British Association. Laws of Wave-Motion, with examples and three illustrations. Interesting Analogy between Wave-Motion and Transmission of Light, Heat, Sound, etc. New Views on the subject, with Mathematical Demonstrations. SUPPLEMENT **96.** Price 10 cents.

ARTIFICIAL PRODUCTION OF HAILstones, Rain-drops, and Snow-flakes, for the purpose of studying their Formation.—Abstract of Paper read before the Manchester Literary and Philosophical Society, by Prof. Osborne Reynolds, F.R.S. Two Figures. SUPPLEMENT **118** Price 10 cents. Also, in same number, the Divisibility of Gold, and Curious Facts in Gold Mining; Liquefaction of Hydrogen; Gallium, etc.

PROF. JAEGER'S NEURAL ANALYSIS. —Explanation of Dr. Jaeger's new discovery of "Neural Analysis," an operation by which the muscle nerve indicates graphically what the nerve of smell smells, and what the nerve of taste tastes —these nerves being influenced in the same manner by matter which is appreciable to taste and smell, as the chemical sensory nerves are. Illustrated with numerous diagrams showing the curves produced by the inhalation of smells of different objects, *e.g.*, the curve of joy produced by the odor of pears; curve of anger produced by the odor of rancid butter; curve of nausea produced by the odor of bad drinking-water; and various other neural curves produced by smelling different substances. Contained in SUPPLEMENT **256.** Price 10 cents. The same number contains an article on "Clothing in its Relation to Health," wherein Dr. Jaeger's ideas in regard to the use of wool for clothing to prevent diseases are set forth and explained.

ON A FOURTH STATE OF MATTER.—By Wm. Crookes, F.R.S. A substantiation by the author of his previous enunciation of the existence of a fourth or ultra-gaseous state of matter. Explanation of the constitution of matter in its three states of solid, liquid, and gas. The molecule: what is it? The necessity of classing it in a distinct state or category by itself. Matter in the fourth state the ultimate result of gaseous expansion. A gas nothing more than an assemblage of molecules contemplated from a simplified point of view. Contained in SUPPLEMENT **238.** Price 10 cents.

ON THE CALORIFIC POWER OF FUEL on Thomson's Calorimeter.—An important paper by J. W. Thomas, F.C.S., F.I.C., in which the author points out the disadvantages of Thomson's calorimeter, and recommends a new and uniform method of procedure to ascertain the relative calorific power of different coals, and by means of which the great differences in the results obtained by chemists may be overcome. Contained in SUPPLEMENT **288.** Price 10 cents,

ON THE APPLICATION OF ROTATING Mirrors to the Measurements of Minute Lengths, Angles, and Times. By Alfred M. Mayer. On Wheatstone's Experiments to Measure the Velocity of Electricity and the duration of the Electric Discharge. *On the Determination of the Velocity of Electricity through conducting Bodies. The Experiments of Feddersen, Henry, Rood, and Mayer on the Nature and Duration of the Electric Discharge. Prof. Rood's researches on the nature and duration of the discharge of a Leyden jar connected with an induction coil. Prof. Mayer's Experiments on the Electric Discharge of the Induction Coil.* Description of Prof. Mayer's apparatus by which the whole history of a flash from the coil is permanently recorded by the discharge itself on a rapidly revolving disk of smoked paper. The new results that have been obtained with this apparatus. This valuable and interesting paper, full of new and remarkable facts, and with 21 cuts illustrating apparatus and experiments, is contained in SCIENTIFIC AMERICAN SUPPLEMENT, **165** and **168.** Price 10 cents each.

THE POLARISCOPE AS APPLIED TO Sugar Manufacturing and Brewing.—By J. Steiner. A very thorough and lucid exposition of the principles which underlie the construction of the Polariscope; a complete description of the instrument itself; and an explanation of the laws which govern it, and permit its application for the determination of the different Sugars that are familiar to us; and why it has become of such importance to the Manufacturer and Refiner of Cane Sugar, as it must some day be to every brewer. Illustrated with five engravings. Contained in SUPPLEMENTS **201** and **202.** Price 10 cents each.

OPTICS.—BY F A. HAMILTON. A very thorough and lucid explanation of the laws which govern the reflection and refraction of light, and a demonstration of the proper manner of applying these laws practically in illuminating dark localities, such as cellars and subterranean passages. Illustrated with fourteen diagrams. Contained in SUPPLEMENT **210**. Price 10 cents.

IMPROVED REFLECTING MAGIC LANtern.—By J. B. Knight. One engraving. Showing how to construct an Exceedingly Cheap, Useful, and Convenient Lantern by which images of paper photographs, engravings, drawings, paintings, and other opaque objects may be enlarged and thrown upon the screen. SUPPLEMENT **87.** Price 10 cents.

PHYSICS WITHOUT APPARATUS.—An interesting series of articles showing how to perform numerous instructive experiments, in every department of physics, by means of common articles found in every household, no other apparatus being required. By following the directions here given, any person may go through an entire course of experimental physics. Illustrated with fifty-four engravings explanatory of the most striking experiments. Contained in SUPPLEMENTS **229, 232, 237, 243, 247, 250, 253, 262, 266, 271,** and **279.** Price 10 cents each.

EXPERIMENTAL DETERMINATION of the Velocity of Light. A paper read before the American Association for the Advancement of Science, August, 1879, by Albert A. Michelson, U. S. N., describing the buildings, the delicate apparatus, and the methods employed by the author in his experiments to determine with what speed light moves both in the air and in vacuo; and giving specimens of the observations, the data for working out observations, and tables of the results obtained. Illustrated with 12 engravings. SUPPLEMENT, No. **193.** Price 10 cents.

STUDIES OF MATTER AND LIFE.—BY Prof. Henry J. Slack, F.R.S. A most interesting and valuable paper, explaining the latest scientific theories, researches, and calculations concerning the various Modes of Motion, the Ether of Space, the Transmission of Wave Forces, the Limits of Vision, the Size of Atoms, Motion, and Force of Atoms, Grouping of Atoms, Phenomena of Reproduction, Mental Phenomena. SUPPLEMENT **27.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Physical Investigation and Apparatus.

THE MODERN TELESCOPE.—BY J. Norman Lockyer, F.R.A.S. Nine illustrations. The Vast Advances Made in Recent Times. Magnifying Power, Focus, Apertures. Diffraction Rings. Illuminating Power of the Telescope. Gemini and Orion as seen by the Naked Eye and by the Telescope. Testing of the Glasses; Defining Power; Double Stars. "Spurious Disk." Climate. Adjustment of Object-glass. A Capital Test Object. Wonderful Perfection of the Modern Object-glass. Saturn as seen by Telescopes of various sizes. Absorption and Imperfect Reflection. Relative Efficiency of Reflector and Refractor. Ventilating or Lattice Tubes. Permanence of Optical Properties. Silvering and Mounting Mirrors, and many Practical Instructions. SUPPLEMENTS **107, 111, 114.** Price 10 cents each.

GRAPHICAL DETERMINATION OF the Volume and Surface of Bodies generated by Revolution.—By Walter G. Berg. Guldin's Rules, with Five Figures. SUPPLEMENT **108.** Price 10 cents.

THE CHEMISTRY OF LIGHT.—BY JOHN E. Fairlie, L.R.C.S. An interesting and instructive lecture delivered before the Glasgow Photographic Association, explaining the nature of light, the chemical changes which it induces among the many substances on the face of the earth; the wonderful power with which it operates on the eye to produce vision and color, and especially its chemical effects in the process of photography. Contained in SUPPLEMENT **222.** Price 10 cents.

HORIZONTAL PENDULUM FOR THE Minute Measurement of Gravitation, Delicate Vibrations, and Microscopic Lengths. Entertaining Description of a Simple and Wonderful Instrument, and How it Responds to the Motions of the Heavenly Bodies, and can Measure the Velocity of Gravitation; with four figures. SUPPLEMENT **112.** Price 10 cents.

EFFECT OF THE MOTION OF AIR within an Auditorium upon its Acoustic Qualities. By W. W. Jacques. The researches detailed in this paper are entirely new to science. The author shows that in most cases where the acoustic properties of public halls are bad, that this is due, not to the arrangement and material of the walls, but to the condition of the air, and that to procure a proper propagation of sound, all air currents must be done away with. He then points out how the latter is to effected. SUPPLEMENT. No. **164.** Price 10 cents.

THE IDENTITY OF THE LINES OF Oxygen, with Bright Solar Lines, as shown in Photographs taken with Increased Dispersion. A paper read by Prof. Henry Draper before the American Association for the Advancement of Science. SUPPLEMENT **194.** Price 10 cents.

SOUND AND THE TELEPHONE.—BY Clarence J. Blake. A paper read before the British Society of Telegraph Engineers. The Human Hearing Apparatus. Acoustical Experiments with the Human Ear Apparatus. How to Make Sound Tracings. Delicacy of the Telephone Disk Movement. An Examination into the Conditions of Articulate Sound. Characteristic Curves for each Consonant, etc., etc. SUPPLEMENT No. **148.** Price 10 cents.

ON THE DETERMINATION OF THE Number of Vibrations made in a second by a Tuning-Fork, with Examples of the Uses of the Tuning-Fork as a Chronometer to mark and register minute intervals of Time. By Alfred M. Mayer. The Tuning-Fork, an excellent Timekeeper. Experiment to show how it may be made to serve this purpose. How the velocity of rotation of a wheel may be measured by a Tuning-Fork. Description of the apparatus for showing this. How the apparatus is used, how the calculations are made, and the results that are obtained. The laws of falling bodies written on a falling plate by a Tuning-Fork. Examples of its application to such purposes. Experiments to show that with such a simple instrument all the laws of falling bodies may be shown, and a permanent record of them preserved on the smoked plate upon which they were traced by the vibrating fork. The velocities of cannon balls measured by the Tuning-Fork. Description of the apparatus known as the Tuning-Fork Chronoscope. How it is used to determine the comparative velocities of cannon balls given by various qualities of gunpowder, and the importance of such tests to the efficiency of an army. The speed with which the nervous motor and sensitive agent travels along the nerves measured with the Tuning-Fork. Explanation as to how the fork is used almost universally in physiological experiments to time the speed of the nervous motive agent and the contractile waves in the muscles. The graphic results of such an experiment shown by means of a figure. The interesting facts that have been observed by experiments of this kind on man and the lower animals. Illustrated with four engravings. SCIENTIFIC AMERICAN SUPPLEMENT, No. **160.** Price 10 cents.

THERMOMETER SCALE. — A VERY Useful Combination Scale, full Size, enabling an Instantaneous Comparison of Numbers on the Fahrenheit, the Reaumur, and the Centigrade Thermometers; with Formulæ for Converting the Units of one scale into Units of another Scale. SUPPLEMENT **141.** Price 10 cents.

Chemistry and Chemical Apparatus.

CHEMICAL REAGENTS, BY MALVERN W. Iles. Importance of Purity in Chemical Reagents. Enumeration of Impurities Detected in Ammonium Hydrate, Acetate, Carbonate, and Chloride; Ammonia Iron Alum; Ammonium Sulphate; Arsenic Salts; Barium Carbonate, Chloride, and Nitrate; Calcium Chloride; Chrome Alum; Hydrochloric Acid; Hydrodisodic Phosphate; Magnesium Sulphate; Nitric Acid; Plumbic Acetate; Minium; Potassium Antimoniate, Oxalate, Hydrate, and Sulphate; Sodium Acetate; Stick Potassa; Sodium Carbonate; Sulphuric Acid; Sheet Zinc; with character of Impurities and Name of Manufacturer. SUPPLEMENT **98.** Price 10 cents.

HOW TO MAKE LAGER BEER.—SUPPLEMENT **217.** Price 10 cents.

MANUFACTURE OF SULPHATE OF Ammonia, with details of apparatus.—SUPPLEMENT No. **268.** Price 10 cents.

PHOSPHORESCENT SUBSTANCES.—Barium sulphide, strontium sulphide, calcium sulphide (Ceuton's phosphorus), calcium and antimony sulphides, chloride of calcium, calcium nitrate, various preparations of phosphorus. A complete practical article. SUPPLEMENT **318.** Price 10 cents.

THE PURIFICATION AND SOFTENING of water. Description of the Porter-Clark process for purifying and softening water, now largely adopted in manufactories, in public and private buildings, for town water supply, and for purifying water for steam boilers in order to prevent incrustation. With eight figures, showing: Apparatus as used at the India-rubber. Gutta Percha, etc., Works, Silverton; arrangement of apparatus at the Swindon Waterworks; front and longitudinal elevation of apparatus at Edge Hill, Liverpool, and arrangement of an apparatus for from 2,000 to 4,000 gallons per hour. Contained in SUPPLEMENT **280.** Price 10 cents.

OUTLINES OF CHEMISTRY.—BY HENry M. McIntyre. The following elements are treated plainly and concisely, with their Atomic Weights, Formulæ, Tests, Important Compounds, Practical Uses, etc. Selenium, Tellurium, Phosphorus, Silicon, Boron, and their Compounds. The Metals: their Classification. Potassium, Sodium, Lithium, Rubidium, Cæsium, Ammonium, Barium, Strontium, Calcium, and their Compounds. Iron, Chromium, Manganese, Tin, Arsenic, Antimony, Bismuth, and their Compounds. Copper, Lead, Thallium, Mercury, Silver, Gold, Platinum, Palladium, Rhodium, Ruthenium, Osmium, Iridium, and their Compounds. Organic Chemistry. Ethyl Alcohol; Ether: Acetic, Oxalic, Tartaric, and Citric Acids. Glycerin; Saccharine Bodies; Starch; Cellulose. Contained in SUPPLEMENTS **144, 145, 153, 158.** Price 10 cents each.

MANIPULATION OF CHEMICAL APparatus.—A paper replete with valuable hints to the professional and amateur chemist. Treating of: Methods of grinding, boring, inserting, fastening, and removing glass stoppers; boring, pressing, cutting, and fastening cork stoppers; pouring from bottles; inserting tubes; preservation of corked vessels, etc. Illustrated with twenty-one figures. Contained in SUPPLEMENT **290.** Price 10 cents.

PETROLEUM AND ITS EXAMINATION. —By A. Bourgougnan. A description read before the American Chemical Society, of the methods adopted by the author in his examinations of crude petroleum, refined petroleum, naphtha, and residuum; preceded by an interesting account of the geographical distribution of oil-bearing strata, and the processes of obtaining the crude product; with valuable tables showing the hydrocarbons that have been eliminated from petroleum, and comparisons of the oils obtained from various parts of the world, as regards their volatile products, specific gravities, etc. Contained in SUPPLEMENT **204.** Price 10 cents.

EXPLOSIONS FROM COMBUSTIBLE Dust.—By Prof. L. W. Peck. An interesting lecture, demonstrating that all combustible material, when finely divided in the form of a dust or powder, will, under proper conditions, burn with explosive rapidity. It points out how and why disastrous explosions frequently occur in flour mills and in candy manufactories, through the presence in the air of mill dust, flour of different kinds, and of starch; gives the chemical composition of the latter materials; explains by a few simple experiments what takes place when they come in contact with a flame; and shows what a prodigious power these materials exert when they burn suddenly in a confined space. Illustrated with four engravings. Contained in SUPPLEMENT **166.** Price 10 cents.

ALCOHOL IN NATURE.—A DETAILED account of the remarkable researches of M. Müntz, of the Agronomic Institute, France, which led to the unexpected discovery that alcohol exists everywhere distributed throughout nature—in the earth, water, and atmosphere. With six figures, showing the apparatus used in analysis and the iodoform crystals obtained with the different materials experimented upon. Contained in SUPPLEMENT **288.** Price 10 cents.

THE CHEMISTRY OF BREAD MAKING. —By Prof. Graham, D.Sc. A recent lecture before the London Society of Arts, treating of the peculiarities of ovens, the chemical changes which take place in the loaf during baking, the number of loaves that may be obtained from 100 lb. of flour, carbonic acid breads, how bread is digested, the chemical action of saliva, how tobacco should be smoked (if smoked at all), value of bread and other foods, average composition of various articles of food, why the laborer needs fat, mechanical equivalent of food, weight of food required to raise 140 lb. 10,000 ft. high. Contained in SUPPLEMENT **222.** Price 10 cents.

PRODUCTS OF COMBUSTION.—BY Thos. Wills, F.C.S. Lecture delivered before the British Association of Gas Managers. Heat a Mode of Motion. Spontaneous Combustion of Iron. Decay and Combustion Identical, and Same Amount of Heat Evolved in Each Case. Chemical Action and Spontaneous Combustion of Zinc-ethyl. Phosphorus set on Fire by Water. Combustion of Bisulphide of Carbon. Inflammability of Coal Gas. Curious Differences resulting from the manner of Firing Gun-cotton. Combustibles and Non-combustibles. Temperature Produced by the Blowpipe. Quantity of Air required for Combustion. Illuminating Fuels—Candles, Sperm Oil, Gas. Amount of Vitiation of the Air produced by Gas-burning and Respiration. Ventilation, and its Curious Dependence on Building Material. Enormous quantities of Air required for Coal Mines. Dangers from Organic Matter in Ventilated Rooms. Products of Gas-combustion, and Injury to Metals, Book-bindings, etc., by the Sulphurous Acid from Gas. SUPPLEMENTS **139, 140.** Price 10 cents each.

ON THE CONSTITUTION OF MATTER in the Gaseous State. An important and valuable Contribution to Science. By Charles Adolphe Wurtz, Professor of Chemistry at the Ecole de Medecine, Paris. Being a lecture, with brilliant experiments, recently delivered by him at the Royal Institute before the Chemical Society, London. This lecture embodies the Most Recent and Accurate Information Concerning the Constitution of Matter, and shows the Most Important Advances Made in Chemistry. It explains the theory of Molecules and Atoms, and presents in clear and concise form a vast amount of information. Contained in SUPPLEMENT **156.** Price 10 cents.

SPONTANEOUS COMBUSTION.—A paper read before the Society of Arts, London, by Chas W. Vincent, F.R.S. An able Exposition, clearly explaining the nature of Heat; how it is produced by disruption and by combustion; how spontaneous combustion results; effects of fermentation; spontaneous combustion of coal; spontaneous combustion on ships; how carbon spontaneously ignites; Faraday's Interesting Experimens. SUPPLEMENT **81.** Price 10 cents.

SUSPENSION, SOLUTION AND CHEMIcal Combination.—By Wm. Durham, F.R.S. Experiments on Suspension of Clay in Water, Clay in Acid Solutions, Clay in Salt Solutions, with Investigations with 12 other Solutions, resulting in Four Conclusions. SUPPLEMENT **116.** Price 10 cents.

VEGETABLE COLORING MATTERS.—Experiments proving the necessity of light in developing the Colors of Plants. Chemical Character of the Coloring Matters. Causes of Autumnal Tints. Construction of the Color Cells, etc.; causes of Color in Flowers. SUPPLEMENT **76.** Price 10 cents.

ACTION OF SEA-WATER ON LEAD and Copper.—A paper read before the Manchester Literary and Philosophical Society by Wm. H. Watson, F.C.S. Also numerous chemical notes. SUPPLEMENT **79.** Price 10 cents.

ON AIR AND WATER.—BY JOHN Tyndall. An exceedingly interesting lecture, being one of a course of six delivered before a juvenile audience at the Royal Institution, explaining, in the lucid style of which Prof. Tyndall is master, all the important laws and phenomena relating to air and water. Contained in SUPPLEMENT **220.** Price 10 cents.

CHEMISTRY OF THE POTATO—VALUE of the Potato to the Starch Manufacturer and the Stock Raiser. Testing Potatoes. Best Method of Cooking, etc. Several other Chemical Essays, as the Alkaline and Boracic Lakes of California, Determination of Ammonia, the Action of Sea Water on Lead and Copper, Proceedings of Chemical Societies, etc. SUPPLEMENT **79.** Price 10 cents.

DETECTION OF ALCOHOL WHEN used as an Adulterant of the Essential Oils.—By Edmund W. Davy, M.D. A New Test, with full Directions for Applying. SUPPLEMENT **95.** Price 10 cents.

CRYSTALLIZATION TABLE.—BY MM. Finot and Bertrand. A table of value to chemists and pharmacists, showing the point at which the evaporation of certain solutions is to be interrupted in order to obtain a good crop of crystals on cooling. Contained in SUPPLEMENT **303.** Price 10 cents.

CHEMISTRY FOR AMATEURS.—AN INteresting collection of experiments, illustrating some of the fundamental truths of chemistry, and requiring for their performance only the addition of a spirit lamp and a few test tubes, illustrated with engravings showing—Reaction between nitric acid and iron; Experiment with Pharaoh's Serpents; Formation of Crystals of Iodide of Cyanogen; Experiment with Ammoniacal Amalgam; Pyrophorus burning in contact with air; and mercury forming an amalgam with gold. Contained in SUPPLEMENT **259.** Price 10 cents.

EXPERIMENTS FOR BEGINNERS.—A valuable set of experiments for beginners in the art of dyeing, the performing of which understandingly will serve to make clear many of the otherwise obscure and puzzling passages which the learner finds in the text books relating to his art. Contained in SUPPLEMENT **257.** Price 10 cents.

CHEMICAL EXAMINATION OF VOLAtile Oils.—A paper by Prof. W. L. Dudley, of Miami Medical College, giving in a compact and convenient form the properties and tests which are accepted by chemists and pharmacists as the most reliable for the various impurities contained in volatile oils. The adulterants and tests for the same are given of the following oils: Anise, Bergamot, Bitter Almonds, Cajeput, Cloves, Copaiba, Coriander, Erigeron, Juniper, Lemon, Mustard, Peppermint, Rose, and Thyme. Contained in SUPPLEMENT **287.** Price 10 cents.

GUMS, RESINS, AND WAXES.—BY C. G. Warnford Lock. SUPPLEMENT **300.** Price 10 cents.

DETECTION OF LEAD IN POTABLE Waters by means of Potassium Bichromate.—By Sidney Harvey. SUPPLEMENT **300.** Price 10 cents.

HOP ANALYSIS, PRINCIPLES OF.—BY Dr. G. O. Cech. SUPPLEMENT **303.** Price 10 cents.

FURNACE FOR THE MANUFACTURE of Sulphide of Carbon.—Illustrated. SUPPLEMENT **299.** Price 10 cents.

CRYSTALLIZATION TABLE.—SUPPLEMENT **303.** Price 10 cents.

MERCURY, DELICATE TEST FOR.—SUPPLEMENT **293.** Price 10 cents.

CHEMICAL ACTION IN A MAGNETIC Field.—By Ira Remsen. SUPPLEMENT **293.** Price 10 cents.

DESTRUCTIVE DISTILLATION.—By Owen Merriman. SUPPLEMENT **306.** Price 10 cents.

PREPARATION OF NEUTRAL OXAlate of Potassium.—By E. B. Shuttleworth. SUPPLEMENT **306.** Price 10 cents.

DETERMINATION OF POTASSIUM.—BY L. L. de Koninck. SUPPLEMENT **306.** Price 10 cents.

ON THE SEPARATION OF HYDROCARbon Oils from Fat Oils.—By A. H. Allen, F.C.S. SUPPLEMENT **307.** Price 10 cents.

CHLOROPHYL.—PRINGSHEIM'S REcent investigations. SUPPLEMENT **293.** Price 10 cents.

DESTRUCTIVE DISTILLATION.—BY "Owen Merriman." SUPPLEMENT **306.** Price 10 cents.

THE DETECTION OF LEAD IN POTAble Waters by means of Potassium Bichromate.—By Sydney Harvey. SUPPLEMENT **300.** Price 10 cents.

DISINFECTION BY NITROUS OXIDES. —With two figures of French disinfecting apparatus. SUPPLEMENT **291.** Price 10 cents.

RAPID DETECTION OF THE PREsence of Water in Alcohol and Ether.—By Carl Mann. SUPPLEMENT **289.** Price 10 cents.

SOME CHEMICAL REAGENTS.—SUPPLEMENT **296.** Price 10 cents.

SYNTHESIS OF AMMONIA.—SUPPLEMENT **296.** Price 10 cents.

APPLICATIONS OF ARTIFICIAL COLD in Industrial Chemistry.—By J. W. Slater. The future of freezing machines as the antipodes of the furnace. SUPPLEMENT **254.** Price 10 cents.

TIN CRYSTALS.—METHOD OF MANUfacture and the reactions of the salt upon various natural coloring matter. SUPPLEMENT **249.** Price 10 cents.

PROCESSES FOR PURIFYING OILS with alkalies.—M. Blondeau. SUPPLEMENT **246.** Price 10 cents.

THE MANUFACTURE OF NITRO-GLYcerine. SUPPLEMENT **243.** Price 10 cents.

METHYL CHLORIDE.—ITS CHEMISTry and uses, and the preparation of methylic products. SUPPLEMENT **239.** Price 10 cents.

CACHOU DE LAVAL.—MODE OF PREparation of the color, dyeing cotton velvet, fixing, dyeing cotton yarn, fixing bath, compound colors, calico printing. SUPPLEMENT **238.** Price 10 cents.

THE NEWER ARTIFICIAL COLORING Matters derived from Benzine. By R. J. Friswell, F.C.S. SUPPLEMENT **232.** Price 10 cents.

NEW METHOD OF PREPARING SULphureted Hydrogen. By J. Fletcher, F.C.S. This process is a simple, cleanly, and elegant substitute for the old methods, and well suited for small and private laboratories. SUPPLEMENT **203.** Price 10 cents.

CAUSTIC ALCOHOL.—ITS MODE OF preparation and application. By Prof. A. B. Prescott, M.D. SUPPLEMENT **163.** Price 10 cents.

CENTRIFUGAL APPARATUS FOR Purifying Gases.—Description and figures of new apparatus invented by Dr. Otto Braun. SUPPLEMENT **173.** Price 10 cents.

ARTIFICIAL SYNTHESES OF ORGANIC Compounds.—By John M. Stillman. SUPPLEMENT **165.** Price 10 cents.

NITRIC ACID.—AN ECONOMICAL method of reproducing it from the lower oxides, in order to make it available in many industrial enterprises where its cost now render it inapplicable.—By Bernard C. Molloy. SUPPLEMENT **165.** Price 10 cents.

PRESERVATIVE GASES AND VAPORS for animal substances. SUPPLEMENT **165.** Price 10 cents.

HOW TO STRENGTHEN ALCOHOL.—SUPPLEMENT **186.** Price 10 cents.

HOW TO TEST THE DYE OF COLORED Fabrics.—SUPPLEMENT **187.** Price 10 cents.

NAPHTHALENE.—ITS HISTORY, CHEMistry, and mode of preparation. SUPPLEMENT **183.** Price 10 cents.

CHEMICAL RECREATIONS.—BY PROF. Albert B. Prescott.—Description of some instructive experiments to illustrate various forms of oxidation. SUPPLEMENT **183.** Price 10 cents.

PEROXIDE OF HYDROGEN.—BY GEO. E. Davis. Preparation, preservation, and value in analytic investigations. SUPPLEMENT **184.** Price 10 cents.

THERMO-CHEMICAL INVESTIGATION. —By M. M. P. Muir. A new method of research which promises to throw light on those phenomena classed under the name of valency. SUPPLEMENT **184.** Price 10 cents.

THE CHEMISTRY OF PLANTS.—BY R. Warington. SUPPLEMENT **175.** Price 10 cents.

GAS AS FUEL.—A COMPARISON OF this with other colorific agents. SUPPLEMENT **175.** Price 10 cents.

HOW TO DISTIL MERCURY.—WITH two figures of apparatus. SUPPLEMENT **216.** Price 10 cents.

HOW TO DETERMINE THE SPECIFIC Gravity of Liquids.—With one figure. SUPPLEMENT **216.** Price 10 cents.

A NEW QUANTITATIVE ANALYTICAL Method of Extensive Applicability.—By Prof. A. Classen. SUPPLEMENT **205.** Price 10 cents.

GLOVER'S TOWER FOR MANUFACturing Sulphuric Acid.—With four figures of plant. SUPPLEMENT **258.** Price 10 cents.

Pharmacy, Etc.

PERFUMERY.—BY W. A. SAUNDERS, Pharmacist.—A valuable and practical paper upon the preparation of Perfume Extracts. With formulæ for the preparation of the most prominent and popular Perfumes now on the market, directions for the preparation and compounding of the ingredients, etc. The Formulæ here given embrace the preparation of the following Perfumes: Jockey Club, Moss Rose, White Rose, Victoria, Ess. Bouquet, Musk, Patchouly, Millefleur, Ylang Ylang, Spring Flowers, Wood Violets, West End, Tuberose, Stephanotis, Rondeletia, New Mown Hay, Frangipanni, Clove Pink, Violet, Mignonette. SUPPLEMENT **65.** Price 10 cents.

SMALL LABORATORY FOR PHARMAceutical and Chemical purposes.—By G. F. Schacht. A Compact, Convenient, and Economical Equipment for Working, with cost, and four engravings, showing arrangement in detail. SUPPLEMENT **99.** Price 10 cents.

ROSE OIL, OR OTTO OF ROSES.—BY C. G. W. Lock. A very comprehensive paper. Sources of oil of rose. The otto-yielding roses. History. Chemical composition. Where the rose gardens are located. Method of cultivation. Manner of extracting the otto. Adulterations. Value of the exports. Contained in SUPPLEMENT **275.** Price 10 cents.

NEW DISTILLATORY APPARATUS FOR Pharmaceutical Purposes, Recovering Alcohol, Making Fuid Extracts, etc.—By Joseph P. Remington. Description and One Cut of a Still that has Proved its Superior Efficiency. SUPPLEMENT **110.** Price 10 cents.

HOULGRAVE'S GELATINE EMULSION. Additional details by the author in regard to preparing his celebrated Gelatine Emulsion for photographic purposes, with formulæ and full directions for using them; recipes for developers, and directions for developing. Contained in SUPPLEMENT **211.** Price 10 cents.

SAPONINE FROM THE BARK OF Quillaia, Saponaria.—By H. Collier. Researches in the determination of the precise nature of Saponine as it exists in the well-known "Soap-tree" bark, or Quillaia. Although this saponaceous principle has been the object of numerous investigations, the results obtained by the author and his assistants may be regarded as the most satisfactory of any that have been published. Contained in SUPPLEMENT **200.** Price 10 cents. The same number contains a valuable paper by the same writer, on "Tincture of Quillaia as an Emulsifying Agent," pointing out its great value to pharmacists in the preparation of emulsions containing Chloroform, Castor oil, Cod-liver oil, Olive oil, Turpentine, Copaiba, Tolu, Guaiac, etc.

THE IDENTITY OF THE LINES OF Oxygen, with Bright Solar Lines, as shown in Photographs taken with Increased Dispersion. A paper read by Prof. Henry Draper, before the American Association for the Advancement of Science. SUPPLEMENT **194.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Pharmacy, Etc.

SALICYLIC ACID.—A VERY COMPREhensive article on this very important antiseptic agent. General properties of salicylic acid. Its uses in medicine and surgery, and in veterinary practice. Industrial properties in connection with the preservation of meat, milk, butter, beer, wine, jams, jellies, fruits, eggs, glue, ink, etc., and in tanning processes and sugar factories. Household purposes. For disinfecting, etc. The descriptions and directions here given will enable any one interested in the matter to find out the best means of deriving profit from the wonderful properties of this extremely useful substance. Contained in SUPPLEMENT **226**. Price 10 cents.

VASELINE IN PHARMACY. — BY Nathan Rosenwasser, Ph.G. Properties, Recommendations, and Uses of Vascline, with Recipes for several Cerates and Ointments, as Vaseline Simple Cerate; Resin Cerate; Cerate of Extract of Cantharides; Pomatum Camphoratum; Ointment of Iodine; Citrine Ointment; Iodide of Iron Ointment; Ointment of Benzoin; Ointment of Iodide of Sulphur; Belladonna Ointment, Ointment of Nitrate of Silver. SUPPLEMENT **153.** With several other Chemical and Pharmaceutical Articles. Price 10 cents.

THE ESSENTIAL OIL OF GINGER.— By J. C. Thresh, B.S. SUPPLEMENT **308.** Price 10 cents.

NITRITE OF AMYL —ITS VALUE AS A domestic remedy. SUPPLEMENT **299.** Price 10 cents.

NOTES ON GUMS, RESINS, AND WAXES. —By C. G. W. Lock. Economic notes on these products, derived from the journals of recent travelers. SUPPLEMENT **300.** Price 10 cents.

EXPLOSIVE COMBINATIONS IN PHARmacy.—SUPPLEMENT **300.** Price 10 cents.

HEAVY PARAFFIN OIL IN PHARmacy.—By Chas. Symes. SUPPLEMENT **310.** Price 10 cents.

STEAM BLOWING APPARATUS FOR Laboratories. With one figure. SUPPLEMENT **233**. Price 10 cents.

GELATINE FOAM.—BY RUEBEN Brooks.—SUPPLEMENT **300.** Price 10 cents.

ARCHITECTURE, ART, ETC.

Buildings and Construction.

COLOGNE CATHEDRAL.—A FULL page illustration of the celebrated *Cologne Cathedral*, with history and architectural particulars, may be found in SUPPLEMENT **257**. Also a description of the remarkable historical procession which took place in 1880, at Cologne, in honor of the finishing of the Cathedral, in SUPPLEMENT **259**. Also page engraving illustrating the placing of the Finial Capstone of this Cathedral, in SUPPLEMENT **265**. Price 10 cents each, or 30 cents for the set.

$150 SUMMER COTTAGE. BY S.B. REED, Architect. A Neat two room House for family of four. Dimensions, Cost of Materials and Labor, Six Plans and Elevations, and all Details of Construction, given in SUPPLEMENT **136**, with an illustrated description of an IMPROVED CONSTRUCTION FOR GREENHOUSES, CONSERVATORIES, etc. Price 10 cents.

CONCRETE FLOORS FOR BUILDINGS. By A. C. Ponton. A valuable article, containing information derived from actual experience in the use of concrete slabs for floors, with tests of strength, etc. SUPPLEMENT **36.** Price 10 cents.

The set of six numbers, containing the articles on concrete, sent for 60 cents.

CHIMNEY CONSTRUCTION. — READ before the Civil and Mechanical Engineers' Society, London, by J. M. Bancroft.—Temperature of the Escaping Gases, and Best Dimensions for Chimneys. Directions for Foundations. Dimensions, Foundations, and Time of Building of the following Chimneys, with Cost and Number of Bricks required: Townsend chimney, Port Dundas; St. Rollox Chemical Works chimney, Glasgow; Dobson & Barlow's Machine Works chimney, Lancashire; Edinburgh Gas Works chimney; Wesenfield & Co.'s Chemical Factory chimney, Prussia; Edward Brooks & Sons' Fire Clay Works chimney, Huddersfield; Mitchell Bros.' chimney, Bradford; Cox Bros.' Camperdown Linen Works chimney, Dundee; Circular chimney, Adams' Soap Works, near Birmingham. How to Protect chimneys from Lightning; also Important Account of How a Chimney was Straightened. SUPPLEMENT **116.** Price 10 cents.

BUILDING CONCRETE WALLS.—A paper of special practical interest to farmers, giving important practical instruction on this important subject. Preparations for building a concrete wall. Preparation of the concrete. Concrete walls under old buildings. Contained in SUPPLEMENT **285.** Price 10 cents.

FIREPROOF DWELLINGS OF CHEAP Construction.—A valuable and important paper, containing Plans and Descriptions of Model Fireproof Dwellings of cheap construction lately erected in Chicago. By J. Smith, Architect. With 9 illustrations. Plan No. 1 exhibits the construction of comfortable one-story, 16 ft. front, dwellings, of brick and concrete, finished complete, at a cost of $1,200. Plan No. 2 exhibits the construction of a comfortable 23 ft. front, two-story dwelling, of brick and concrete, finished complete, with cellar, for $1,700. Several of these dwellings, on both plans, have been built at the prices stated. This valuable paper also contains the Report of the City Authorities of Chicago, certifying to the fireproof nature of these buildings, as determined by severe trials by fire, made in their presence, with other useful particulars. SUPPLEMENT **91.** Price 10 cents.

ARTISTS' HOMES. — A SERIES OF views and plans illustrating the dwelling houses of the leading painters, architects, and sculptors of England, accompanied by detailed descriptions of the same, has been published in the following numbers of the SUPPLEMENT:

Mr. W. Burgess's house in No. **231**; Mr. Marcus Stones's, in No. **233**; Mr. W. Holliday's, in No. **238**; Mr. Colin Hunter's, in No. **240**; Mr. Basil Champney's, at Manor Farm, Hampstead, in No. **247**; Mr. J. C. Dollman's, in No. **248**; Sir F. Leighton's, in No. **259**; Mr. Val. C. Prinsep's, in **261**; Mr. S. Luke Fielde's, in No. **267**; Mr. Alfred Waterhouse's, in No. **270**; Mr. Harrison Weir's, in No. **275**; Mr. J. Boehm's, in No. **299**. Price 10 cents each, or $1.20 for the entire series.

COVERED BARN YARD AND FARM Buildings.—Description and 4 illustrations of a Covered Homestead on a Norfolk (Eng.) Farm. Directions for Construction and Dimensions. Also How to Construct a Covered Barn Yard, with engraving, dimensions, etc. SUPPLEMENT **118.** Price 10 cents.

CURVILINEAR ROOFS.—AN IMPORtant and valuable paper, illustrated by 50 figures, exhibiting the forms of all the principal styles of curvilinear roofs now in use. Embracing the drawings of the roof of the great railway depot of the Northern of France, Paris. SUPPLEMENTS **40, 42.** Price 10 cents each.

CONCRETE WALLS.—A PAPER CONtaining a hint worthy of being considered by every farmer, and designed to dispel some of the erroneous notions that are held in regard to building sidehill barns. This essay shows how an old barn can be raised, and a good concrete wall placed under it so as to give as good a stable as if under a new barn. Gives plain and full directions how to raise the old barn, how to make the concrete, and how to build the wall. Demonstrates that the old sidehill plan is unnecessary. Tells how to build the drive-ways, and sums up the total cost. SUPPLEMENT, No. **183.** Price 10 cents.

COMPACTED BEAMS. TABLING, INdenting, and other methods of Combining Beams, with other Suggestions for the Use of Wood in Works of Magnitude, and Useful Historical Examples. SUPPLEMENT **117.** Price 10 cents.

HOW TO BUILD A GREENHOUSE.—DIrections and Dimensions, with eleven figures. SUPPLEMENT **141.** Price 10 cents.

CONCRETE DWELLINGS.—READ BY B. H. Babbage before the Adelaide Philosophical Society. Details of a Successful and Instructive Experiment. A Dwelling constructed entirely of Lime Concrete—Walls, Roof, Staircases, and Arches fifteen feet in width. SUPPLEMENT **111.** Price 10 cents.

HOW TO BUILD CONCRETE WALLS.— Practical directions how to build walls for barns, dwellings, and other purposes, by the concrete method, which is the most economical system in use. SUPPLEMENT **13.** Price 10 cents.

THE MATHEMATICS OF CONSTRUCtion.—By R. G. Hatfield, Architect. The Graphical Representation of Strains; Valuable Formulæ; Rules, and their Application to the Construction of Floors, etc., with illustrated description of the Walker Art Gallery, Liverpool, and the Great Church of Batalha, Portugal. SUPPLEMENT **96.** Price 10 cents.

SCHOOL HOUSE DESIGN. BY F. LANGdon, Architect. With Engraved Plan. Being a new and excellent design for villages and small cities; combining strength, beauty, and convenience. Also, an important and exhaustive paper on the Ventilation and Warming of School Houses. By Dr. F. Winsor. SUPPLEMENT **98.** Price 10 cents.

THE CATHEDRALS OF GREAT BRItain.—Full page illustrations, with descriptions of the following Cathedrals noted for their architectural beauty and proportions, published in the SUPPLEMENT, as follows: *Ely Cathedral*, SUPPLEMENT **145.** *Bath Abbey Church*, SUPPLEMENT **169.** *Wells Cathedral*, SUPPLEMENT **196.** *Lichfield Cathedral*, SUPPLEMENT **219.** *Worcester Cathedral*, SUPPLEMENT **238.** *Carlisle Cathedral*, SUPPLEMENT **244.** *Lincoln Cathedral*, SUPPLEMENT **262.** *Peterborough Cathedral*, SUPPLEMENT **285.** *Chichester Cathedral*, SUPPLEMENT **290.** *Glasgow Cathedral*, SUPPLEMENT **300.** Price 10 cents each.

CONCRETE BUILDING.—DESIGNS FOR cottages built of concrete, with elevations of the cottages and plans; also engravings of the apparatus, ingredients, method of mixing, preparing, and working the concrete, cost, etc. By Henry Macaulay, architect. With eleven illustrations. SUPPLEMENT **30.** Price 10 cents.

FORCE OF WIND. HOW TO ESTIMATE Required Strength of High Buildings, Towers Chimneys, and Spires. Formulas for Force of Wind at Various Velocities against Vertical Surfaces, and against Roofs at various Pitches; with three figures. SUPPLEMENT **109.** Price 10 cents.

PAINT IN CONSTRUCTION. BY ROB'T Grimshaw, C.E. Peculiarities and Chemical Constitution of Paris White, White Lead, Zinc White, Baryta White, Blende, Antimony White, Iron Oxide, Red Led, Prussian Blue, Cobalt Blue, Smalt, Coal Tar, Soluble Glass, Yellow Ocher, Raw Sienna, Fuller's Earth, Lampblack, with Valuable Practical Hints. SUPPLEMENT **125.** Price 10 cents.

FIREPROOF CONSTRUCTION. — READ by F. Schumann, C.E., before the American Institute of Architects. With 16 Figures. Maximum Temperature of a Fire. Protection of Constructive Ironwork. Details of Construction of Brick Arches, Flat Hollow Tile Arches, and Corrugated Sheet-iron Arches. Protection of Lower Flange of Beams. Cast-iron Protected Columns. Slated Roofs, with Purlins, Bolts, and all Details. Flat Roofs Covered with Metal Sheets or Cement. Burnt Clay Tile Roof. Metal Box Roof. Ordinary Floors. SUPPLEMENTS **137, 139.** Price 10 cents each.

HINTS ON BUILDING CHIMNEYS.— By Daniel Morse. SUPPLEMENT **163.** Price 10 cents.

HOSPITAL OF ST. ELOI AT MONTpellier, France.—By Frederick J. Monat, M.D. F.R.C.S. SUPPLEMENT **307.** Price 10 cents.

ROOF COVERING.—A VALUABLE table for the use of those who have occasion to calculate the loads on roofs. SUPPLEMENT **255.** Price 10 cents.

DRIVING NAILS.—PRACTICAL HINTS on the subject. SUPPLEMENT **267.** Price 10 cents.

FLOORS FOR HORSE STABLES, BEST Materials for.—SUPPLEMENT **308.** Price 10 cents.

DURABLE COATING FOR PRESERVing Zinc Roofs.—SUPPLEMENT **206.** Price 10 cents.

Architectural Materials.

CONCRETE AS A BUILDING MATERial.—A Lecture delivered before the Royal Institute of Architects, London, by A. Payne, with discussion of the subject by prominent architects. This lecture and the extended discussions of the subject are contained in SUPPLEMENTS **26** and **34.** Price 10 cents each. They present a large amount of valuable information upon concrete building, in concise form.

BETON CONCRETE IN ARCHITECTure and Engineering, with 20 illustrations. Beton Bridge; Erie R. R. Portage Viaduct repaired with Beton; Beton Dwellings and Fountain, Brooklyn, N. Y.; Beton Church; Beton Culvert Lining, Erie R. R.; Beton Arches, Church Tracery, etc.; Beton-lined Railway Tunnels; Beton Pavements; Crushing Strength of Beton; Superior Strength of Beton Arches, etc. SUPPLEMENT **118.** Price 10 cents.

IRON AS A BUILDING MATERIAL.—A comprehensive review, giving the objections to the Architectural Use of Iron, and its Advantages; How to Treat Iron Artistically; What a Fireproof Building is; Cast and Wrought Iron under Fire; Valuable Suggestions How to Use Iron in Fireproof Structures. SUPPLEMENT **71.** Price 10 cents.

INCRUSTATIONS ON BRICK WALLS. By William Trautwine. The various causes: Bricks Burned with Coal Fires; Sulphate of Magnesia: Dampness; Effect of common Mortar. Remedies. Also Report of the Sub-committee, on the same subject, appointed by the University of Pennsylvania. SUPPLEMENT **123.** Price 10 cents.

NOMENCLATURE OF BUILDING Stones and Stone Masonry.—By James R. Croes, William E. Merrill, and Edgar B. Van Winkle. A paper read before the American Society of Civil Engineers. An exhaustive article on Stone Cutting and Masonry, various Methods of Dressing, and Tools employed, with 34 illustrations. Nineteen Tools, illustrated, with Dimensions and How to Make. Squared, Quarry-faced, Pitched-face, and Drafted Stones, Rubble, Cut, Pointed, and Crandalled Stones, etc. Axed or Pean Hammered and Patent Hammered Stones. Bush Hammered and Rubbed Stones. Diamond Panels, Rubble, Squared Stone, Range, Random, and Ashlar Masonry. 34 illustrations in all, with practical instructions. SUPPLEMENT **113.** Price 10 cents.

CAST IRON BUILDING FRONTS AND their Decoration.—By J. P. Putnam. The strength, durability, non-combustibility, lightness, and economy of iron. Right and wrong modes of decoration. Iron combined with terra-cotta with excellent effect. SUPPLEMENT **100.** Price 10 cents.

THE CEMENTS AT THE CENTENNIAL Exhibition. By Q. A. Gillmore, U. S. A. The Portland Cements and Their Tests, and four methods of Manufacture. The Natural Quick-setting Cements, etc.; Materials for Cements; Localities where Obtained; Specific Uses for the various Cements; A Large and Valuable Tabular Statement of the Crushing and Tensile Strength of each variety exhibited and Names of Exhibitors; Excellent articles on Concrete Construction and other Architectural and Engineering subjects. SUPPLEMENT **64.** Price 10 cents.

ON THE PRESERVATION OF WOOD. By J. Clark Jefferson, A.R.S.M. How to store timber. How to measure timber and judge of its quality. Causes and Prevention of Dry and Damp Rot. Durability and Preservation of timber in Mines. The three methods of Artificial Preservation: 1. Coating timber with Tar, etc. 2. Removing Sap by water or by steam. 3. Impregnating the wood by a solution of common salt, Sulphide of Barium, Sulphate of Zinc and Copper, etc. A valuable practical paper. SUPPLEMENT **119.** Price 10 cents.

BETON TUNNELS AND ARCHES.—AN important paper, showing the recent successful application of beton to the lining of railway arches where stone and bricks are from various causes inapplicable. Beton is impervious to water, makes a lighter and stronger lining, and is less costly than other materials. Illustrated with five engravings, showing the application of beton to the lining of arches on the Erie Railway. Contained in SUPPLEMENT **227.** Price 10 cents.

CHEMISTRY OF BUILDING MATERials. The bearings of chemical science on certain prominent materials used for building purposes, such as stones, limes, mortars, cements, bricks, marble, etc. 1. A brief account of the general principles of chemistry. The chemical substances which enter into the composition of the abovenamed materials, their characteristics, and directions for ascertaining their presence in any mineral. 2. Examination in detail of the several varieties of stone found in the earth, both as regards the proportions of their constituents, and their chemical and other properties. Contained in SUPPLEMENT **279.** Price 10 cents.

CONCRETE FOR EMBANKMENTS AND Dams.—SUPPLEMENT **306.** Price 10 cents.

THE DURABILITY OF REDWOOD.— SUPPLEMENT **308.** Price 10 cents.

OXIDATION OF BUILDING MATERIals.—SUPPLEMENT **278.** Price 10 cents.

ASPHALTUM. — A COMPREHENSIVE paper, treating of its geological origin, mode of preparation for industrial purposes, and most important applications. Bitumen, Chemical Composition, and Physical Properties. Geographical distribution. Geological origin. Formation of Asphaltum. Bituminous mastic. Uses and applications of Crude Asphaltum. Mode of preparation for sidewalks and pavements. Applications of Bituminous Mastic or Cement. Asphalt as a preservative against fires. Illustrated with engravings, showing the probable formation of asphaltum in soft limestone strata; the construction of pavements from crude asphalt at Paris, and the mode of making sidewalks. Contained in SUPPLEMENT **276.** Price 10 cents.

CEMENTS.—RECIPES, SELENTIC, MARtin's, Keene's, Parian, Hydraulic, Portland, Sal Ammoniac, Shellac, Venice Cements, and Mastic, Malin Stone; Artificial Stone, and Insoluble Glue; with Description and Uses of Lime, Gypsum, Red Lead, etc. Contained in SUPPLEMENT **133.** Price 10 cents.

POROSITY OF BUILDING MATERIALS. —A paper of great interest to the heating and ventilating engineer and architect, showing the variable amount of porosity in the different building materials in use, and the consequent varying amount of natural ventilation which is thereby effected, and which is very undesirable in buildings which are properly ventilated. Illustrated with one engraving. Contained in SUPPLEMENT **224.** Price 10 cents.

FIRE-BRICK AND TERRA-COTTA. — By Andrew McL. Packer. I. The Fire-Brick Process—describing the clay used in the manufacture of Fire-Bricks, its Chemical Composition, and the Geological Formations from which it is derived, and the process of manufacture of the bricks. II. The Terra-Cotta Process—describing the clays used, their composition, the preliminary treatment which they undergo before fashioning, and the mode of manufacturing wares from them. Contained in SUPPLEMENT **208.** Price 10 cents. The same number contains an interesting article on Bricklaying in France.

MASONRY AND BRICK-WORK. — BY J. Clark Jefferson. The Required Properties of Bricks. Properties of the clay sizes of Bricks in Germany and United States. Brickmaking, Mortars and Cements. Limes, fat and poor. Care and Slaking of Lime. Sand. The Chemical Change necessary to the Hardening of Mortar. SUPPLEMENT **148.** Price 10 cents.

MODELING IN CLAY.—BY EDWARD A. Spring. Materials. Tools. Practical hints for modeling. SUPPLEMENT **181.** Price 10 cents.

Drawing, Designing, Etc.

ORNAMENTAL DESIGNS. — SUGGEStions in Floral Design, by F. E. Hulme, F.S.A. SUPPLEMENTS **15, 18, 34, 115.** Price 10 cents each.

Directions for Making Cheap and Elegant Household Ornaments. SUPPLEMENTS **7, 112.** Imitation of Inlaid Wood, with Practical Directions. SUPPLEMENT **10.** Price 10 cents each.

Marble Clock. SUPPLEMENT **36.** Clock in Carton-pierre. SUPPLEMENT **99.** Candlestick and Candelabra. SUPPLEMENT **69.** Vase, Clock, and Candelabrum, Style of Louis XIV. SUPPLEMENT **64.** Price 10 cents each.

Damascened Ornaments from a Shield. SUPPLEMENT **120.** Silver Lamp Pendant. SUPPLEMENT **45.** Antique Marble Vase. SUPPLEMENT **98.** Price 10 cents each.

Carved Panel Ornaments for Wood and Metal, for Stove Doors, etc. SUPPLEMENTS **36, 43, 50, 63, 81, 82.** Price 10 cents each.

Designs for Lamp-posts. SUPPLEMENTS **4, 44, 108.** Iron Window Grilles. SUPPLEMENTS **44, 60.** Iron Railings, Gates, and Balconies. SUPPLEMENTS **70, 91, 117.** Iron Stairs. SUPPLEMENT **60.** Price 10 cents each.

Stone Monument, with Railing. SUPPLEMENT **117.** Cement Ornaments. SUPPLEMENT **44.** Chimney-pieces. SUPPLEMENTS **51, 121.** Staircase, Jacobean Style. SUPPLEMENT **53.** Ceiling Ornaments in Carton-pierre, etc. SUPPLEMENTS **89, 106.** Ceiling of Boudoir, Painted. SUPPLEMENT **116.** Designs for Fresco Painting. SUPPLEMENT **102.** Price 10 cents each.

Marquetry Ornaments. SUPPLEMENTS **66, 89, 136.** Old German Carpet. SUPPLEMENT **93.** Tapestry, Painted and Woven. SUPPLEMENT **75.** Price 10 cents each.

Writing Table and Chairs. SUPPLEMENT **43.** Inlaid Card Table. SUPPLEMENT **31.** Bronze Flower-pot stand. SUPPLEMENT **55.** The Table as an Object of Art, with 12 illustrations of the several styles. SUPPLEMENT **58.** Carved Buffets. SUPPLEMENTS **67, 123.** Chairs. SUPPLEMENTS **83, 92.** Table, Style of Louis XIV. SUPPLEMENT **74.** Upright Piano. SUPPLEMENT **100.** Harp. SUPPLEMENT **101.** Price 10 cents each.

Sixteen Designs of Majolica Tiles. SUPPLEMENT **107.** Ornamental Designs for Scissors, Knives, and Forks. SUPPLEMENT **77.** Gimmal Finger-Rings. SUPPLEMENT **43.** Modern Italian and French Jewelry. SUPPLEMENT **104.** Coffee-pot of Oxidized Silver. SUPPLEMENT **79.** Book Covers. SUPPLEMENT **91, 128.** Price 10 cents each.

Fence and House Trimmings, 29 Designs. SUPPLEMENT **68.** Price 10 cents.

From one to three large Engravings, with a Description accompanying each of the above designs, the whole series being illustrated by about one hundred and sixty engravings. The designs are chosen from Modern, Mediæval, and Ancient Sources; from Germany, France, and Italy, and illustrate all the leading Styles of Ornamental Art. Price 10 cents for each number.

SUGGESTIONS IN DECORATIVE ART. —A beautiful series of illustrations of various artistic objects, offering valuable hints to designers, has been published in the SUPPLEMENT, as follows:

DESIGN FOR CORNER MOUNT OF BOOK cover.—SUPPLEMENT **160.**

MURAL FOUNTAIN IN MAJOLICA WARE. —SUPPLEMENT **163.**

ORNAMENTS FOR DECORATIVE PAINTING. —SUPPLEMENT **202.**

DESIGN FOR LOOKING-GLASS FRAME IN Oak.—SUPPLEMENT **206.**

MOSAICS IN THE CHANCEL OF CORK Cathedral.—SUPPLEMENTS **214** and **224.**

ORNAMENTAL CAPITALS, ST. CHAPELLE, Paris.—SUPPLEMENT **230.**

MISERERES IN LINCOLN CATHEDRAL.— SUPPLEMENT **231.**

CARVED CASKET IN OAK.—SUPPLEMENT **232.**

DESIGN FOR BOOK-COVER IN LEATHER Mosaic.—SUPPLEMENT **239.**

DESIGN FOR A GATE.—SUPPLEMENT **241.**

VARIOUS ARCHITECTURAL CARVINGS.— SUPPLEMENT **245.**

TOP OF DOORWAY IN WROUGHT AND Hammered Iron, sixteenth century.—SUPPLEMENT **247.**

CAPITALS OF PILLARS, ITALIAN RENAISsance. Parved Panel Ornament.—SUPPLEMENT **249.**

ORNAMENTAL INITIALS, (COMPLETE ALphabet) —Reserved part of a great Saloon. Design for a Mantlepiece in Walnut. SUPPLEMENT **259.**

GATE FROM THE INCLOSURE OF THE Tabor Cromenade in Rennes, Bretagne.—SUPPLEMENT **264.**

MIRROR FRAME IN WOOD, CARVED AND Gilt.—SUPPLEMENT **265.**

A DRAWING ROOM CORNER.—AN OCTAgan Boudoir. SUPPLEMENT **268.**

A COLLECTION OF PLAIN AND ORNAmental Borders. Panel from Communion Table Cathedral of Verdun.—SUPPLEMENT **272.**

ORNAMENTAL EMBLEMS IN CAST IRON.— SUPPLEMENT **277.**

TABLE IN ITALIAN WALNUT.—SUPPLEMENT **284.**

ENCLOSURE OF THE GOETHE MONUMENT; and Design for Balcony Railing.—SUPPLEMENT **287.**

BORDER ORNAMENTS, MARBLE MOSAIC Cavement, Siena Cathedral, fouthteenth to sixthteenth century.—SUPPLEMENT **294.**

WROUGHT IRON OBJECTS.—WOOD BASkets, Candle Standard, Umbrella Stand. Wine Cooler, and Music Desk. SUPPLEMENT **295.**

SILVER EWER.—BY ODIOT, PARIS. SUPPLEMENT **299.**

ORNAMENTAL DETAILS IN RELIEF.—SUPPLEMENT **302.**

OLD WROUGHT IRON GATE, GUILDHALL, Worcester. SUPPLEMENT **303.**

AN ACROBATIC ALPHABET FOR LETTERers and Ornamenters. SUPPLEMENT **305.**

MONUMENT BY R. DIETELBACH, SCULPtor, Stuttgart.—SUPPLEMENT **309.**

ROSE PAPER FOR WALL DECORATION. SUPPLEMENT **310.**

CARVED PEDESTAL LIBRARY TABLE IN Walnut, with marquetry in three colors.—SUPPLEMENT **267.**

The numbers containing the above may be had at 10 cents each.

ACROBATIC ALPHABET. — ILLUStrated. SUPPLEMENT **305.** Price 10 cents.

ART ON THE STAGE.—HOW STAGE Scenery is painted. SUPPLEMENT **290.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Drawing, Designing, Etc.

AIDS TO DRAWING. — A VALUABLE paper containing: (1) Engravings and Descriptions of the Construction and Use of the PANTOGRAPH, for Accurately and Quickly Copying Drawings, Photographs, Maps, Diagrams, etc., making the Copies larger or smaller or of the same size of the original. Any intelligent person may construct and use the Pantograph by following the directions here given. (2) Also, Drawings and description for the Construction of the CAMERA LUCIDA, a simple and valuable little instrument for making drawings direct from the object, and in Copying, Enlarging, or Diminishing Drawings, Photographs, etc. (3) Also, Drawings and description of the CAMERA OBSCURA, a simple, effective, and cheaply made little instrument by which Landscapes, Dwellings, and other objects may be easily drawn by any person with accuracy, although unskilled in drawing. (4) Also, THE SKETCHING FRAME, with drawings and descriptions for Construction and Use. A handy contrivance for ladies and others for assistance in outdoor drawing, portraiture, etc. (5) Also, THE REFLECTING DRAWING BOARD. A simple device in which the reflection from a pane of glass is made to throw down upon paper an image of the drawing to be copied, all the operator has to do being to draw the outline before him. (6) Also, THE TRANSPARENT DRAWING TABLE, showing how to construct a drawing board in which the light is thrown under and upward through the drawing, thus greatly facilitating the making of copies of any drawing. (7) Also, THE PROPORTIONAL DIVIDERS; being a simple instrument for enlarging or reducing drawings from one scale to another with Accuracy and Rapidity. (8) Also, THE PERSPECTIVE RULER. A simple device for the Correct and Rapid Drawing of the Perspective lines in Drawing. The construction of all these various instruments is illustrated with engravings, and accompanied by plain, simple directions to enable any person at a small cost to make and use them. This is the most Valuable Paper of the kind ever published. The whole contained in SUPPLEMENT **158.** Price 10 cents.

MECHANICAL DRAWING.—BY PROF. C. W. MacCord, of the Stevens Institute of Technology. A series of new, original, and practical lessons in Mechanical Drawing, accompanied by carefully prepared examples for practice, with directions, all of simple and plain character, intended to enable any person, young or old, skilled or unskilled, to acquire the art of drawing. No expensive instruments are involved. Any person with slate or paper may rapidly learn. The series embodies the most abundant illustrations for all descriptions of drawing, and forms *the most valuable treatise upon the subject ever published, as well as the cheapest.* The series is illustrated by upward of 450 special engravings, and forms a large quarto book of over one hundred pages, uniform in size with the SCIENTIFIC AMERICAN. Price, stitched in paper, $2.50. Bound in handsome stiff covers, $3.50. Sent by mail to any address on receipt of price. Address Munn & Co., Publishers, 37 Park Row, New York. Office of the SCIENTIFIC AMERICAN.

AUTOGRAPHIC PRINTING PROcesses.—By Thomas Bolas, F.C.S. A series of short descriptions of the various processes which have been invented during recent years for the rapid production of small numbers of autographic prints. The Electro-Chemical Process. The Papyrograph. The Edison Electric Pen. Zuccato's Late Improvement. Callography. Pellet's Plan for Copying Drawings. Contained in SUPPLEMENT **225.** Price 10 cents.

HOW TO DRAW A STRAIGHT LINE.—By A. B. Kempe, B.A. With 33 engravings. An important essay on the several mechanisms for drawing Mathematically Straight Lines. Directions for making simple Home-made Instruments for this purpose; Beautiful Mathematical Problems; Geometrical Principles Involved; and full Description of all the most successful apparatus. SUPPLEMENTS **84, 85, 86, 87.** Price 10 cents each.

DETERIORATION OF OIL PAINTINGS.—By R. Liebreich, M.R.S., etc. A lecture delivered at the Royal Institute of Great Britain. A Description of the structure of Paintings and the Methods of Different Schools; the Injuries, Decays, and Chemical Changes to which Paintings are Liable; and the Best Methods of Restoration, with useful suggestions to Artists how to paint Durable Pictures. Contained in SUPPLEMENT **151.** Price 10 cents.

A SIMPLE PANTOGRAPH.—DESCRIPtion and figure of a cheap form of pantograph, noteworthy on account of its compact form and its simplicity. As the instrument is capable of describing a circle of four feet radius, drawings of considerable size can be reduced by it. Contained in SUPPLEMENT **242.** Price 10 cents.

THE ACROBATIC ALPHABET. — AN ornamental alphabet of which the different letters are derived from the human figure in various attitudes. Useful to all letterers and ornamenters. Contained in SUPPLEMENT **305.** Price 10 cents.

ORNAMENTAL INITIALS.—A COMplete alphabet of ornamental initials in Old English Text, very useful for painters, decorators, and those interested in the art of illumination. Contained in SUPPLEMENT **259.** Price 10 cents.

THE ART OF MARBLING ON PAPER.—By C. W. Woolnough. How it is done. What prevents the mingling of the colors. Kinds of mucilage used. Action of the Gall. Practical Directions. An operation beautiful in its simplicity, and instructive, as exhibiting the action of a natural law. SUPPLEMENT **119.** Price 10 cents.

DECORATIVE ART SUGGESTION.—Illustration of Carved Oak Casket in the Art Industry Museum, Berlin. Date 1540 Three figures. Contained in SUPPLEMENT **232.** Price 10 cents.

DRAUGHTING TEMPLET. — FIGURE and description of a templet invented by Mr. J. A. David, of Paris, by the use of which all the letters of the alphabet, numerals, and various ornaments may be drawn. Very simple, and easily constructed, after the figure here given, by any one having a little mechanical ingenuity. Contained in SUPPLEMENT **236.** Price 10 cents.

PSEUDO KERAMICS.—HOW TO MAKE vases of pasteboard in imitation of decorated pottery. Eight engravings of examples of this work. Cylinder vases with ornaments in high relief Elliptical vases. Triangular, and square vases. How to shape the pasteboard. How to make the joints. How to prepare for painting, and how to paint them. SUPPLEMENT **317.** Price 10 cents.

PERSPECTIVE CARRIAGE DRAUGHTing.—by A. Muller. With one figure. SUPPLEMENT **267.** Price 10 cents.

PROCESS FOR PRINTING OR TRANSferring designs. By L. Zweig and A. T. Tischler. SUPPLEMENT **180.** Price 10 cents.

POPULAR SCIENCE OF COLOR.—A comprehensive treatise on color by Johannes Hirrlinger, a water color artist of Stutgart. This interesting paper treats on the various phenomena of color under the following heads, viz.: Mixing of colors. Phenomena of gradual contrast of colors simultaneous contrast of colors. Harmony of colors. Discord of colors. Grey pigments. Hints as to the juxtaposition of colors in decorative arts. Hints as to proper mode of exhibitng colored fabrics and other colored goods. How the same goods appear darker, or brighter, with different surrounding or contiguous colors. Harmony and discord of colors in dress. An account of interesting cases of deception by the gradual or simultaneous contrast of color. A very interesting paper, valuable to artists, decorators, merchants, milliners, housekeepers, and all interested in æsthetics. SUPPLEMENT **317.** Price 10 cents.

ORIENTAL STYLE AS APPLIED TO fabrics.—A paper containing many valuable hints to designers. With fourteen cuts of ornamental designs for fabrics. SUPPLEMENT **164.** Price 10 cents.

DESIGNING FOR TEXTILES.—WITH one cut. SUPPLEMENT **170.** Price 10 cents.

Archæology.

PERUVIAN ANTIQUITIES. BY E. R. Heath, M.D., the most recent visitor to the home of the Incas. An intensely interesting account of the Remarkable Ruins and Walls of the Jequetepeque Valley, Peru. The prisons of Pizarro and Atahualpa. Description of the Wonderful Huacas, or burial mounds, near Truxillo. Accounts of the immense treasures of Gold that have been found in the Huacas. The immense Huacas, near Ancon and Passamayo, and the interesting relics found therein. The extensive ruins of the Huatica Valley. The Huaca of Pando. The Huaca of the Bell. Description of the Temples and Fortresses of the Huatica Valley. The Huaca of Ocharan, the largest burial mound in the valley, inclosing 117 acres. The great Inca Temple of the Sun, in the Valley of Lurin, and its dimensions. The extensive ruins in the Canete Valley, and the interesting relics that have been discovered in them. The effects of earthquakes that have taken place on the Peruvian coast. The extraordinary Masonry composing the walls, temples, houses, towers, etc., in the Mountain districts. The wonderful Structures in the City of Cuzco. The Ruins on the Islands in Lake Titicaca. The notable Ruins at Chavinde Huanta, Corralones, Huaytar, Nazca, and Quelap. Half a Million Miles of Wonderful Stone Wall, averaging 3 to 4 feet high, and enough to encircle the globe ten times! Who were the people that constructed this and the other wonders of Peru? The Ancient Peruvian Records and what we learn from them. The geologic changes that have taken place in Peru; the rising and sinking of its coast, and the several risings and sinkings of the Andes. Speculations as to whether a great continent once occupied the present site of the Atlantic. This valuable paper, by a well-known American Archæologist and a close and patient observer, contains much that is new, and is written in an exceedingly pleasant style. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **158** and **159.** Price 10 cents each.

EGYPTIAN OBELISKS AND THEIR Relation to Chronology and Art. By Basil H. Cooper. A Lecture before the Society of Arts, London. Egyptian Religious Ideas, and How the Form of the Obelisk expressed them. How the Monoliths were Quarried. How they were Transported. Incredible Engineering Feats. The Hieroglyphics and their Wonderful Interpretation by the Rosetta Stone. Interpretation of Chronological Eras. SUPPLEMENT **119.** Price 10 cents.

ARCHÆOLOGICAL EXPLORATIONS IN Ohio.—An account of explorations made near Madisonville, O., in 1878, 1879, and 1880, the results of which are the most interesting of any that have hitherto been conducted in the Mississippi Valley; with descriptions and forty illustrative figures of a large number of aboriginal relics, such as skeletons, ash-pits, corn-pits, earthen pots, vases and bowls, pipes, shell ornaments and beads, elk-horn ornament, copper ornament, and child's rattle. Contained in SUPPLEMENT **282.** Price 10 cents.

ARCHÆOLOGICAL EXPLORATIONS IN TENNESSEE. By F. W. Putnam. An exceedingly interesting narrative of Prof. Putnam's explorations of the celebrated burial mounds of a prehistoric race in the State of Tennessee; illustrated with 55 engravings, copied from the author's own drawings, of the various relics found by him, such as Weapons of War, and Household Implements, in Jasper, Flint, Hornstone, Copper, and Bone; Ornaments of Shell, Copper, and Flint; Earthern Jars, Pots, Bowls, and Dishes, many of them of very curious shapes, and Pipes of Stone and earthernware of singular and interesting forms. Accompanied by descriptions of the various articles, and a map of the locality where found. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **169, 170, 171, 172,** and **173.** Price 10 cents each, or 50 cents for the series.

ANCIENT AMERICAN POTTERY.—AN interesting review by the well-known American archæologist, Prof. F. W. Putnam, of the results of recent labors on the part of members of the St. Louis Academy of Science, in collecting the relics of the mound builders within the State of Missouri. Illustrated with twenty-eight figures of earthen jars, vases, kettles, bottles, dishes, etc., accompanied by critical remarks on the same by the above-named author. Contained in SUPPLEMENT **261.** Price 10 cents.

EGYPTIAN ANTIQUITIES. — AN INteresting narrative of a tour of the River Nile, with descriptions of the more interesting localities and their monuments. Illustrated with ten engravings, giving views of the Temple at Esneh; Pylon of Ptolemy Euergetes; Front of the Great Temple at Aboo Simbel; Denderah; Karnak; Colossi at Thebes; Rameseum, with fallen figure of Rameses II.; General View of Philæ; Whirling Dervishes; Fountain or Well. Contained in SUPPLEMENT **273.** Price 10 cents.

A RECENT VISIT TO POMPEII.—BY H. D. Garrison. SUPPLEMENT **180.** Price 10 cents.

ANTIQUITY OF MAN IN EASTERN America Geologically considered.—By H. C. Lewis, A.M. SUPPLEMENT **258.** Price 10 cents.

CENTRAL AMERICAN ANTIQUITIES—With six figures. SUPPLEMENT **289.** Price 10 cents.

DISCOVERIES IN WESTERN CAVES.—By Rev. H. C. Horvey. SUPPLEMENT **162.** Price 10 cents.

RECENT ASSYRIAN DISCOVERIES.—With four cuts. SUPPLEMENT **157.** Price 10 cents.

THE RECENT DISCOVERIES IN EGYPT.—With four illustrations. SUPPLEMENT **307.** Price 10 cents.

IMPORTANT ARCHÆOLOGICAL DISCOVERIES in Syria.—SUPPLEMENT **302.** Price 10 cents.

AGRICULTURE, FORESTRY, ETC.

Farming, Horticulture, Forestry, Etc.

SUGGESTIONS TO THE FARMER AND the Grocer.—Eggs; Poultry Fertilizers; A Test of Potatoes; Detection of Watered Lard; Adulteration of Pepper; Green Hay; Calculus in Horses; How to Soften Hard Water; New Mash for Horses; Preservation of Butter, etc., with useful Household Hints. SUPPLEMENT **53.** Price 10 cents.

FARM LAW.—BY HON. EDMUND H. Bennett. This paper, which was read by the author before the State Board of Agriculture of Massachusetts, is full of important information regarding points of law not generally known, and with which not only farmers but every person in business should be acquainted. It tells how to buy a farm or other property, how the deed should be drawn, what constitutes farm boundaries, what a deed of a farm or property legally includes, what rights the owner has in the roadway, what the law is in regard to fences, the law as concerns the impounding of cattle, the farmer's liability for trespasses of his animals, the question of liability for and protection against dogs, the law in regard to water rights and drainage, what constitutes trespassing on the farm or property, the law in regard to the ownership of fruit hanging over the boundary line between two properties, or over roads. *About Hiring Help*—What the laborer is entitled to if no bargain is made; what he forfeits by leaving before his time expires, etc.; laws on the subject. *The Employer's Liability for his Men*—Illustrated by examples and with the legal aspects of each. *About Fires*—The liability of a hunter who fires a farmer's woods; the right of the farmer to burn brush, and how far he is responsible if fire is communicated to his neighbor's premises; how far he is liable to his neighbor for damages arising from fires through lightning or spontaneous combustion, the liability of railway companies for damages arising from fires communicated by locomotives. *Ways Over the Farm*—Various examples of right of way, and the laws on the subject. *Warranty of Seeds*—The two phases of the question that are of special interest to farmers and others, and their legal aspect. By making himself thoroughly familiar with the various law points which are carefully and fully considered in this paper, all farmers and property owners will be prepared to save himself thousands of dollars in the way of lawyers' fees and the expenses that often follow litigation. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **166** and **174.** Price 10 cents each.

THE CULTIVATION OF MUSHROOMS. One of the most comprehensive papers ever published on the subject of the artificial cultivation of this esculent; giving an interesting account of the celebrated Mushroom Caves of Paris, their daily production, and the estimated value of the harvest; describing the edible Mushroom or "Champignon" both as regards its external appearance and its internal structure; showing how the mushroom spawn is to be obtained, how the materials are to be prepared, how the beds must be made and the spawn planted; telling what additional care and precautions are necessary after planting the spawn; pointing out the various places where Mushrooms may be successfully raised, such as on shelves, in tubs, and in the floor of cellars, on shelves in stables, in special beds, or in melon frames in the open air, etc. Directions for gathering the crop. What other species of fungi are occasionally cultivated. Some of the Mushrooms that are eaten in Russia. How the Mushroom is cultivated in Japan. By following the exceedingly simple directions given in the article, any one may provide himself with Mushrooms for his table all the year round, and at but trifling expense, or engage in the profitable occupation of supplying the market with this delicacy. Illustrated with 8 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, **178.** Price 10 cents.

THE FIRST SILO.—A PAPER OF GREAT interest to agriculturists, detailing the mode of construction of the first "Silo" built in America, describing the manner in which it was filled with fodder and how the ensilage appeared on the day of opening, and giving the results of the experiments, which were a success. Contained in SUPPLEMENT **210.** Price 10 cents.

AGRICULTURAL SUGGESTIONS. POTash in Agriculture. Formulas for Fertilizers. Obligations to Commerce. Grape Culture. A Fruit Evaporator. How to Exterminate the White Daisy. Pork Raising. SUPPLEMENT **132.** Price 10 cents.

EXPERIMENTS IN THE USE OF LIQUID Manure. A record of experiments extending over several years on the relative values of liquid manures derived from various domestic animals—horses, cattle, and pigs. Conclusions of the author as to the superiority of liquid cow manure, with directions as to how and when to be applied. Contained in SUPPLEMENT **239.** Price 10 cents.

NEW METHOD OF GERMINATION.—By M. Gruber. Description of a new apparatus for conducting and controlling the process of grain germination by mechanical appliances, so as to altogether dispense with manual labor in turning the grain over on the germinating floor, and insuring a most regular and uniform development of both rootlets and plumule; followed by a full description of M. Gruber's improved process for germinating grain. With one illustration. An article of great interest to brewers and maltsters. Contained in SUPPLEMENT **169.** Price 10 cents.

INSECTS AND HOW TO FIGHT THEM.—A paper of great value to the agriculturist, pointing out the most effectual means of destroying the following pests, cut-worms, May-beetles, slugs, ants, aphides, and scale insects. Contained in SUPPLEMENT **232.** Price 10 cents.

CULTIVATION OF MEDICINAL PLANTS at Hitchin, England.—By E. M. Holmes, F.R.S. Full and Practical Directions for Cultivation of Lavender. A Disease of the Plant described. How to Plant and Propagate; When to Harvest; How to Distil the Oils. Directions for Cultivation of Belladonna, Hemlock, Squirting Cucumber, and Henbane. Making Scammony Resin from the Root. SUPPLEMENT **107.** Price 10 cents.

AGRICULTURAL AND STOCK RAISING Subjects. Kittatinny Blackberry.—By E. Williams. Cotswold Sheep, with one illustration. Movable Sheep Shelter, with one figure. Poison for Red Spider. Management of Turkeys. Subterranean Forests and Mesquite Thickets. The Tsetse. SUPPLEMENT **121.** Price 10 cents.

STRAW FOR FODDER. BY PROF. G. C. Caldwell. Chemical Elements required by Animals. Relative Nutritive Value and Digestibility of various articles of Fodder. Oat Straw sometimes better than Meadow Hay. Improving Straw by Slight Fermentation. Also, Directions for Grafting and Laying Down Raspberries. SUPPLEMENT **122.** Price 10 cents.

INDUCED HYSTERICAL SOMNAMBULism and Catalepsy.—By William J. Morton, M.D. An interesting paper descriptive of several remarkable cases of somnambulism and induced delusions, and catalepsy and aphasia, observed by the author during a morning clinic of Prof. Charcot at the Salpetriere. Contained in SUPPLEMENT **256.** Price 10 cents.

CHEAP GREENHOUSES AND HOW TO Heat Them.—By Peter Henderson. How to obtain Perfect Draft. Excellent Plan for Furnace Construction, etc., with two illustrations. SUPPLEMENT **62.** Price 10 cents.

THE CULTIVATION OF CELERY.—A paper read before the Society for the Encouragement of Domestic Industry, by President Robinson, of Brown University, giving his practical experience of many years in raising celery. Celery as a wild plant. English mode of cultivation as practiced in this country. The proper soil for cultivating the plant. Methods of blanching. How celery should be kept in winter. Packing. Profits on cultivation. Contained in SUPPLEMENT **279.** Price 10 cents.

MATERIALISTIC ORIGIN OF THE Sexes.—By Andrew Dewar. A paper in which the author seeks to prove that sex, in either animal or vegetable life, had a materialistic origin—that it is derived from and had its origin in the duality of matter. Contained in SUPPLEMENT **271.** Price 10 cents.

PRUNING OF NEWLY SET FRUIT Trees, with Careful Instructions for Cutting Back, etc., with three illustrations. Additional information on new Vegetables, Orchard Culture, etc. Contained in SUPPLEMENT **109.** Price 10 cents.

HORTICULTURAL NOTES.—A COLLECtion of Notes on the following topics: Liquid Manure for Grapes, Marketing Fruit, the Root Aphis, Yellows in the Peach, Smoking Orchards not a Success, Prevention of Pear Blight, Setting out Blackberries, Plants in Living Rooms, the Fruit Trade at Baltimore, Watering Plants and Trees, Roses for Garden Culture. Contained in SUPPLEMENT **263.** Price 10 cents.

GARDENS.—BY PETER HENDERSON. Instructions for the Cultivation of Rhubarb, Asparagus, Cauliflower, Cabbage, Lettuce, Tomatoes, Peas, Beans, Beets, Onions, etc.; Grapes, Strawberries, Raspberries, Blackberries, Currants, Gooseberries, etc. SUPPLEMENT **134.** With articles on Dynamite in Agriculture, Fodder, Corn, etc. Price 10 cents.

THE CATALPA TREE FOR ECONOMIC Planting.—By C. S. Sargent. Usefulness and Wonderful Durability of the Wood. The Catalpa for Railway Ties. Rapid Growing, and Freedom from Insects. SUPPLEMENT **132.** Price 10 cents.

TRAINED FRUIT TREES. — TWENTYeight Pleasing Methods of Training at Paris Exhibition, each illustrated. How to get the Most Enjoyment out of Gardening. How to Cover Unsightly Walls, etc. SUPPLEMENT **132.** Price 10 cents.

GRAPE CULTURE UNDER GLASS.—BY John Don, Foreman to Peter Henderson. Protection of the Roots; Pruning; Destroying Insects; Giving Air; to Counteract Drought, and all other Directions. SUPPLEMENT **110.** Price 10 cents. In the same number are articles on California Oaks in California; Asparagus Forcing in Paris; Hybridization of the Monukka and Black Hamburgh Grapes; Strawberries; California Oaks.

AGRICULTURAL SUGGESTIONS.—How to keep Stalled Cattle clean. A simple plan that obviates the necessity of cleaning them. One illustration. Hop Culture in New York. Cost of Raising Potatoes. Suggestions for Winter Strawberries. To Destroy Chicken Lice. Influence of Cold on Milk. Cheap Greenhouses. SUPPLEMENT **105.** Price 10 cents.

ECONOMIC PLANTS IN JAMAICA.—Success of Coffee. Cocoa, Sugar Cane, Pineapples, Cocoanut. The Best Kinds and Best Methods of Cultivation. Useful Timber Trees. What has been done in raising Teak. Cultivation of Medicinal Plants. Cinchonia. Eucalyptus, Jalap. SUPPLEMENT **85.** Also, in same number, Potato Culture, Clover, Hone, Manufacture, Superphosphates, etc. Price 10 cents.

FOREST TREE BORERS.—BY MARY E. Murtfeldt. Rapid Decadence of our Forests, and How it is Caused. The Wood-boring Beetles. The Bark-borers. The Wood Weevils, the Saw-horn Wood-borers, and the Capricorn Beetles. The Larvæ. The Enemies of the Hickory, the Ash, the Walnut, the Elm, the Beech, and the Pine. A very Singular Insect, the Twig-Girdler. Interesting Description of these Insects, their Habits, their Parasites, etc., with Directions for Preserving Trees, contained in SUPPLEMENT **131.** Price 10 cents.

SIGHT.—THE INFLUENCE OF SCHOOL Life thereon.—By George Reuling, M.D. The alarming prevalence of short-sight among children, and causes thereof. Structure of the Eye, and How it is Injured. Important Practical Suggestions on Forms of Desks and Seats, Color of Walls, Illumination, Method of Instruction, etc., to prevent optical injury. Over, or Long Sight; its Cause and Prevention. SUPPLEMENT **67.** The same number contains valuable essays and remarks on the suspension of Sewer Particles in the Atmosphere; Treatment of Rheumatism; Croton Chloral in Whooping Cough; Safe Administration of Chloroform, etc. Price 10 cents.

CULTIVATION OF PEANUTS.—WHERE the Peanut is Cultivated; the Soil most favorable Dressing; Manure; Kinds of Peanuts, etc. How to raise a successful crop. SUPPLEMENT **97.** Price 10 cents.

AGRICULTURAL AND HORTICULTUral Subjects.—Sussex Cattle, 1 fig. New Method of Preserving Fodder without barns. Two illustrations. Corn Storer and Hay. Birds and Gardens, with 1 fig. Barnyard Manure. Value of Cow Dung. Cotton Seed as Manure. Manurial Substances. The Tulip Tree. New Grapes. Fertilizers in Gardens. Lime Dust. Low-headed Trees. Liquid Grafting Wax. SUPPLEMENT **70.** Price 10 cents.

THE PEACH TREE: HOW TO PRUNE Properly.—By Prof. S. T. Maynard, with two illustrations. SUPPLEMENT **29.** Price 10 cents.

PROPAGATING RARE PLANTS.—BY Thos. Lawrence. Description of a new method. SUPPLEMENT **183.** Price 10 cents.

POTATOES AND THEIR UTILIZATION.—How to make starch, gum, dextrine, glucose, whiskey, and vinegar from potatoes. Desiccated potatoes. Imitation of alabaster from potatoes. Four engravings. SUPPLEMENT **313.** Price 10 cents.

PRESERVATION OF EGGS.—A THOroughly practical article, giving several well-tried methods of preserving eggs. SUPPLEMENT **317.** Price 10 cents.

AGRICULTURAL PLANT FEEDING.—An article showing the advantages to be gained from the use of certain chemicals in wheat growing. SUPPLEMENT **177.** Price 10 cents.

A NEW FOOD FOR CATTLE.—SUPPLEMENT **200.** Price 10 cents.

ARTIFICIAL FRUITING OF TREES.—The different ways in which a plant or tree may be rendered more fruitful. SUPPLEMENT **254.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Farming, Horticulture, Forestry, Etc.

CATALOGUE OF THE FOREST TREES of North America.—By Prof. C. S Sargent. A complete list of every species of forest tree known to inhabit North America, accompanied by botanical and common name, and geographical distribution, and economic uses as far as known to the author. Contained in SUPPLEMENTS **227, 228, 229, 230, 231, 232, 233, 234, 235**, and **236**. Price 10 cents each.

COTTON SEED OIL CAKE AS A FERtilizer and Food.—By Prof. W. L. Dudley. An important paper to agriculturists, presenting, in a tabular form, the composition of ordinary feeding-stuffs, and of various vegetable fertilizers, and showing therefrom the great superiority of cotton seed cake as a fertilizer and food, from the fact of its containing the largest proportion of valuable constituents. Contained in SUPPLEMENT **245.** Price 10 cents.

CHEMICAL VIEW OF ENSILAGE.—AN account of the results obtained at the Vienna Experimental Station, by Moser, in a series of experiments to determine the nature and extent of the chemical changes taking place in green maize during its conversion into ensilage, and to ascertain the amount of material lost as well as the advantages to be derived from the process in general. Contained in SUPPLEMENT **262**. Price 10 cents.

DIABETES MELLITUS.—BY J. H. SALISbury, M.D. A valuable paper, showing the drinks, food, and medicine that should be used, the clothing that should be worn, and the exercise that should be taken. The author asserts that if this treatment is persisted in for a few months, the diseased habit will be broken up, normal conditions will be restored and become permanent, and the disease will be cured. Contained in SUPPLEMENT **207**. Price 10 cents. The same number contains an able article on Typhoid Fever, by F. J. Maclagan, M.D.

DETERMINATION OF SEX, AND THE Mental and Physical Inheritance of Children.—By J Mortimer Granville, M.D. An interesting summary of certain facts that have been observed and are now brought together by this distinguished writer, going to show that *intention* has a prominent part to play in the determination of sex, and in the revival or repression of inherited forces, by an intelligent use of the laws of nature, and the importance of which is not yet even recognized by physicians. Contained in SUPPLEMENT **264**. Price 10 cents. An interesting article on the same subject, entitled "What Determines the Sex of Children," is contained in SUPPLEMENT **265**. Price 10 cents.

WHEAT CULTURE.—BY MR. GIBSON, of Indianapolis. Wheat Growing in Indiana. Benefits of Clover turned under. Probable advantage of Alkalies. Importance of Perfect Growth of Straw, and How to Obtain it. Burning the Straw on the Field. How to Treat Poor Clay Soils. Bone Dust, and its Astonishing Effect. Gypsum. Wheat Culture of New York and Maryland. Demonstrated Value of Analysis of Soils. Drainage. Selection of Seed. Average Production per acre. Amount of Seed per acre. Causes of Loss. SUPPLEMENT **155**, Together with Seeds and Seed-Planting. Price 10 cents.

CULTURE OF THE RASPBERRY.—A paper compiled by Abel F. Stevens, giving a short history of the fruit; describing the species which are cultivated; telling how the soil should be prepared, the vines planted and pruned and protected in winter, followed by a description of the varieties best suited to climates like that of New England SUPPLEMENT, No. **192.** Price 10 cents.

FIG CULTURE AT THE NORTH—A paper of interest to all fruit culturists, pointing out the fact that the Fig, although a tropical fruit, can be successfully grown in the Northern and Middle States; that no crop will give so certain and so large returns as this; and giving practical directions for planting, pruning, protecting, drying the fruit, and other information in regard to the subject. SUPPLEMENT, **171.** Price 10 cents.

NOTES ON TOBACCO.—BY W. K. Glover. An interesting history of "the weed" in a condensed form, and treated under the following headings: Botanical Origin and Description. Cultivation. History. Consumption. Revenue. Manufacture, etc. Process of making Cavendish, Roll Tobacco, Cigars, and Snuff. Tobacco-leaf Adulterations. Application in Medicine. Chemical Composition. Use and Abuse. SUPPLEMENT, No. **196.** Price 10 cents.

SMALL GREENHOUSES. DESCRIPTION Of Several Greenhouses, with Cost, Modes of Heating, Ventilation, etc., with some Improvements. SUPPLEMENT **150.** Also, Plant Feeding, a Model Farm in Normandy, French Forestry Experiments, and Rain Water Cisterns. Price 10 cents.

COWS AND THEIR BUTTER.—A PAPER of great interest to farmers and dairymen. SUPPLEMENT **167**. Price 10 cents.

CULTIVATION OF BEANS.—THE EXperience of two growers in cultivating beans as a field crop. SUPPLEMENT **174**. Price 10 cents.

CENTRIFUGAL BUTTER MAKING.—Advantages of the Process. SUPPLEMENT **262**. Price 10 cents.

CALIFORNIA RAISINS.—AN INTEResting account of the rise and progress of the raison industry of San Bernardino, Cal. SUPPLEMENT **232**. Price 10 cents.

METHODS OF KEEPING FRUIT.—SUPPLEMENT **159**. Price 10 cents.

HOW TO FEED HENS FOR EGGS.—SUPPLEMENT **166**. Price 10 cents

HOME MADE SUPERPHOSPHATES.—By J. W. Pierce. SUPPLEMENT **171**. Price 10 cents.

HOW TO RAISE TURKEYS.—SUPPLEMENT **227**. Price 10 cents.

HOW TO GROW TUBEROSES.—SUPPLEMENT **208**. Price 10 cents.

ENSILAGE.—BY O B. POTTER.—THE Conditions of Success. The Preserving Pits. Filling the Pits. Mixing the Fodder in the Pits. SUPPLEMENT **241**. Price 10 cents.

ROSE FARMING.—AN ACCOUNT OF the methods of growing roses and manufacturing attar and rose-water in Bulgaria and India. SUPPLEMENT **212**. Price 10 cents.

HOW TO CONTROL SEX IN ANIMALS.—By Prof. Thusy. SUPPLEMENT **211**. Price 10 cents.

GRASS CULTURE.—BY A. F. STEVENS. Importance of the Grass Crop. Facts and Figures. History of Grass Culture. Culture. Sowing the Seed. When to Cut Grass. SUPPLEMENT **186**. Price 10 cents.

CHEAP MANURE FOR GARDENS.—SUPPLEMENT **242**. Price 10 cents.

HOW TO MAKE A POOR SOIL FERTILE.—SUPPLEMENT **180**. Price 10 cents.

HOW TO SOW SEEDS.—SUPPLEMENT **165**. Price 10 cents.

HOW TO MAKE GOOD CIDER AND to Keep It.—Illustrated. SUPPLEMENT **313**. Price 10 cents.

HUMBUGS IN HORTICULTURE.—BY Peter Henderson. SUPPLEMENT **238**. Price 10 cents.

HOW TO SAVE STRAWBERRIES IN A Dry Hot Season.—SUPPLEMENT **234**. Price 10 cents.

HOW TO BUILD SILOS.—SUPPLEMENT **242**. Price 10 cents.

HOW TO DESTROY GRASS, WEEDS, etc. SUPPLEMENT **206**. Price 10 cents.

HARVESTING CARROTS.—PRACTIcal direction; with two figures. SUPPLEMENT **206**. Price 10 cents.

THE GRAPE CROP OF CALIFORNIA.—SUPPLEMENT **164**. Price 10 cents.

THE LATEST ADVANCES IN FRUIT Culture.—The War with Insects. Two papers of importance to the fruit grower. SUPPLEMENT **165**. Price 10 cents.

THE CASTOR BEAN PLANT.—BY EDward Ballaine. Method of Cultivating and Preparing for Market. SUPPLEMENT **186**. Price 10 cents.

THE BEAN.—FABA VULGARIS. BY Louisa Reed Stowell, M. S.—Natural History and Microscopical Structure of the Common Bean. With Twelve figures. SUPPLEMENT **246**. Price 10 cents.

THE PRESERVATION OF TIMBER.—By J. W. Putnam. SUPPLEMENT **236**. Price 10 cents.

HOW TO MAKE HOT-BED FRAMES.—With five figures. SUPPLEMENT **271**. Price 10 cents.

FRUIT CULTURE, LATEST ADVANCES in.—SUPPLEMENT **165**. Price 10 cents.

FERTILIZERS FOR CORN.—BY PROF. Atwater. SUPPLEMENT **166**. Price 10 cents.

FLORIDA ORANGE CULTURE.—SUPPLEMENT **227**. Price 10 cents.

HORTICULTURAL NOTES.—NEW APples, Pears, etc.—Discussion on Grapes—New Peaches—Insects affecting Horticulture—Insect Destroyers. SUPPLEMENT **275**. Price 10 cents.

BEET SUGAR IN FRANCE AND GERMANY.—By John Sparrow. Cultivation. Harvesting. Advantages of Beet Raising. SUPPLEMENT **186**. Price 10 cents.

BEST SHEEP FOR FARMERS.—SUPPLEMENT **161**. Price 10 cents.

TO RAISE CRANBERRIES IN THE GARden. SUPPLEMENT **222**. Price 10 cents.

TWO GOOD LAWN TREES.—SUPPLEment **275**. Price 10 cents.

WATER SUPPLY FOR STOCK.—BY Henry Stewart. How to make cheap, indestructible wooden water conduits for farm purposes. SUPPLEMENT **209**. Price 10 cents.

WHEAT AND HOW IT SHOULD BE prepared.—With One figure. SUPPLEMENT **234**. Price 10 cents.

MEDICINE FOR FOWLS AND HOW TO administer them.—SUPPLEMENT **233**. Price 10 cents.

ALDERS FOR THE LAWN.—BY S. PARsons, Jr. SUPPLEMENT **236**. Price 10 cents.

THE APPLE TREE BORER.—REMEDY for. SUPPLEMENT **167**. Price 10 cents.

VALVE OF ROOTS FOR MILCH COWS.—SUPPLEMENT **262**. Price 10 cents.

WHITE PINES IN MICHIGAN, HISTORY of.—SUPPLEMENT **302**. Price 10 cents.

PRESERVING SEEDS.—SUPPLEMENT **300**. Price 10 cents.

PINE TIMBER, EFFECT OF PROLONGed Stress on.—By Prof. R. H. Thurston. SUPPLEMENT **297**. Price 10 cents.

POULTRY CHOLERA.—VALUABLE paper issued by the Agricultural Department, Washington. SUPPLEMENT **298**. Price 10 cents.

ON THE CULTURE OF TUBEROSES.—SUPPLEMENT **310**. Price 10 cents.

PLANTING FOR PROFIT.—SUPPLEMENT **298**. Price 10 cents.

CORRECT AND INCORRECT THINGS in cotton.—Hints on Baling. Storing. Classification, etc. SUPPLEMENT **304**. Price 10 cents.

BUTTER MAKING, HINTS ON.—SUPPLEMENT **302**. Price 10 cents.

WAR UPON INSECT PESTS.—RULES adopted by the California Horticultural Society for protecting fruit trees and vines from insect ravages. SUPPLEMENT **298**. Price 10 cents.

CULTURE OF RHUBARB OR PIE Plant.—By W. D. Philbrick. SUPPLEMENT **262**. Price 10 cents.

CULTURE OF STRAWBERRIES; DIrections for.—SUPPLEMENT **299**. Price 10 cents.

SMALL FRUITS.—BY W. D. PHILbrick. SUPPLEMENT **264**. Price 10 cents.

HOW TO PRESERVE SEEDS FOR planting.—SUPPLEMENT **300**. Price 10 cents.

HARDY FLOWERS FOR MIDSUMMER.—SUPPLEMENT **299**. Price 10 cents.

SMALL CONSERVATORY DESIGN for, and description of the same.—SUPPLEMENT **224**. Price 10 cents.

PLOWS AND PLOWING.—VALUABLE hints on the best forms of plows, and best methods of using them. SUPPLEMENT **308**. Price 10 cents

PROFITS OF FRUITS AND VEGEtables Grown in Florida.—SUPPLEMENT **308**. Price 10 cents

KEEPING VEGETABLES IN WINTER.—By W. D. Philbrick. SUPPLEMENT **304**. Price 10 cents.

INFLUENCE OF FORESTS ON WATER Courses.—By D. D. Thompson. SUPPLEMENT **307**. Price 10 cents.

THE PRODUCTION OF DOUBLE FLOWers.—A paper of great interest to florists. SUPPLEMENT **284**. Price 10 cents.

CULTIVATION OF PYRETHRUM AND Manufacture of the Powder (Insect Powder). SUPPLEMENT **299**. Price 10 cents.

MILDEW AND MOULDS.—BY A. G. Field, M D. SUPPLEMENT **308**. Price 10 cents.

INSECTICIDES.—BY DR. H. BEHR. SUPPLEMENT **308**. Price 10 cents.

CHEAP ORNAMENTAL GARDENING.—SUPPLEMENT **284**. Price 10 cents.

ASTIGMATISM.—BY C. A. BUCKLIN, M.D. Illustrated. SUPPLEMENT **301**. Price 10 cents.

Agricultural Machinery, Etc.

PLOWS OF ALL NATIONS.—AGRICULtural Implements at French Exhibition from China, Spain, Italy, Denmark, Malaisia, and the colonies of Holland, with nine figures. The display of England, France, and the United States. Wheeled Plows. Comparative Merits of English, French, and American Plows. SUPPLEMENTS **135, 141.** Ten cents each.

PLOW EXHIBIT AT THE PARIS EXhibition. A comprehensive article, with 24 illustrations, describing a great variety of plows, many of them entirely new in this country. SUPPLEMENT **164.** Price 10 cents.

HARVESTING MACHINERY.—BY E. Samuelson. A discussion of some of the mach ines which are in practical use at the present date for harvesting crops. 1. *Mowing Machines.*—The cutting apparatus. General features of design. 2. *Machines for Harvesting Corn, or Reaping Machines.*—Back-delivery reapers. Side-delivery reapers. 3. *Automatic Sheaf Binders.* 4. *Wire-Binding Mechanism.* 5. *String-Binding Mechanism.* Contained in SUPPLEMENTS **291** and **292**. Price 10 cents each.

FLESH AND FAT PRODUCERS FOR domestic Animals.—SUPPLEMENT **302**. Price 10 cents.

PLOWING BY ELECTRICITY.—SUCcessful experiments at Sermaige, France. With one cut. SUPPLEMENT **201**. Price 10 cents.

MOWERS AND REAPERS, CLASSIFIcation of.—By Dr. Alfred I. Kennedy. With seven cuts. SUPPLEMENT **184**. Price 10 cents.

SWEENY IN HORSES; HOW TO CURE —SUPPLEMENT **302**. Price 10 cents.

TIMBER TREES FROM SEEDS,—Method of Raising. SUPPLEMENT **306**. Price 10 cents.

Domestic Animals and Fish Culture.

CANARY BIRDS.—VALUABLE DIRECtions for the proper selection of good Singers, and how to care for them. Cages, how they should be constructed, fitted up, and cleaned. Proper and improper food. What to do in case of sickness. Contained in SUPPLEMENT **248**. Price 10 cents.

A SHORT BIOGRAPHY OF THE MENHADEN.—By Prof. G. Browne Goode, U. S. Fish Commissioner. A paper read before the American Association for the Advancement of Science, August, 1879. An essay full of interest not only to the scientist but to the general reader. The fish here treated of is known under at least 30 popular names in this country, and is of great industrial importance, not only for the oil which it yields, but also as a food, being used as such in either a fresh or salted state, or in oil under the name of "shadines." The habits of the fish are somewhat anomalous, and very little has hitherto been known or written about them. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No **194**, Price 10 cents.

AMERICAN BACON AND PORK.—AN interesting description of the American Bacon and Pork industry, giving careful statistics of the average production of the various sections of the United States and Canada, with values of the product; describing how the hogs are slaughtered and dressed for the market, how bacon is prepared, and how hams and sausages are manufactured; and giving the estimated annual product, value, and mode of manufacture of American Lard. Contained in SUPPLEMENT **236.** Price 10 cents.

THE SPANISH MACKEREL AND ITS Artificial Propagation.—A paper presented to the American Association for the Advancement of Science by Charles W. Smiley. Description of the fish. Habitat and abundance. Method of capture and sale. Market prices. Its migrations. Time of Spawning. Experiments in artificial hatching. Fertilization of the eggs artificially. Experimental apparatus. Practical results. Contained in SUPPLEMENT **250.** Price 10 cents. The same number contains an article on "Boneless Cod: How they are Cured and Prepared for the Market."

POINTS OF A GOOD HORSE.—BEING the Report of the Committee appointed by the New England Agricultural Society to decide upon Rules for Guidance of Judges of Horses. The Points of Excellence, Size, Color, Symmetry of Body, Head and Neck, Eye and Ear, Feet and Limbs, fully described. Speed at the Trot and in Walking, Style and Action, etc., with the percentage allowed for each quality. The Standard, Size and Speed for Matched Carriage Horses, Gents' Driving Horses, Family Horses, Park or Phaeton Horses, etc. An excellent Guide in selecting animals. SUPPLEMENT **103.** Price 10 cents.

ABORTION IN COWS.—BY L. FRANK. Causes; Frosted and Blighted Food; Violent Movements; Lead, Aniline, and other Poisons; a Mysterious Infection, and Important Facts; Bacteria. SUPPLEMENT **132.** Price 10 cents.

ON THE CARE OF HORSES.—BY PROF. Pritchard, R.V.S. Showing the Proper Construction of Stables. Best Floor. Lighting and Ventilation. Hay-racks. Watering and Feeding. Grooming and Exercise. Cracked Heels; Lice; Colic; Mud Fever; Wind Galls. Also, in same number, facts about improved Cow Stables. How to keep Cows clean and maintain Pure Air in Stables. Increased Cleanliness and Convenience with Less Labor. Contained in SUPPLEMENT **123.** Price 10 cents.

THE HORSE'S MOTIONS SCIENTIFIcally Considered, with 22 figures, showing the several positions of body and limb, assumed by the horse in walking and trotting. These engravings are made from instantaneous photographs, taken by an Automatic Electro-photographic Apparatus, giving truthful representations of the movements of the horse, which are at variance with the conventional idea. Contained in SUPPLEMENT **158.** Price 10 cents.

ARTIFICIAL INCUBATION.—DESCRIPtion of a very successful apparatus, which any one can make; 3 illustrations, with temperatures and directions. SUPPLEMENT **54.** Price 10 cents.

OUTWARD MARKS OF A GOOD COW.—By Capt. John C. Morris, Pa. Carelessness in Breeding. How to Select for Breeding. Marks of the Handsome Cow. Care and Training of the Heifer. Infallible Marks of Good Milkers. Distinguishing Marks and Characteristics of the "Bastard" and the "Bogus" Cow, etc. Contained, with useful remarks on Bee Culture, in SCIENTIFIC AMERICAN SUPPLEMENT, No. **135.** Price 10 cents.

RULES FOR THE MANAGEMENT OF Laying Hens.—By Dr A. M. Dickie. A few sensible rules which, applied to the management of laying hens, will insure a full supply of eggs throughout the year. Contained in SUPPLEMENT **230.** Price 10 cents.

SCIENTIFIC BREEDING.—BY J. D. CAton.—An interesting paper on the scientific breeding of domesticated animals—especially of the horse, pointing out the astonishing improvements which, in recent years, have been successively wrought by intelligent and judicious selection. Contained in SUPPLEMENT **273.** Price 10 cents. The same number contains the pedigree and performances of "Don Cossack," with a portrait of the animal.

THE PERFECT HORSE AND HOW TO Measure Him.—Being a description of the celebrated "Kentucky Prince," with table of measures, and an illustrative diagram showing the application of the System to any horse. SUPPLEMENT **29.** Price 10 cents.

THE GUENON MILK MIRROR.—THE external marks by which may be known the amount of milk a cow will yield and the length of time she will hold out in her flow. Full explanation of Guenon's remarkable discovery, with an engraving. Contained in SUPPLEMENT **275.** Price 10 cents

THE HORSE.—PROPORTIONS AND Conformation of the Horse. Lists of Scientific and familiar terms generally made use of to denote the parts of a horse. Accompanied by an engraving showing the outlines as well as the bony structure of a perfect horse, and the proportions and names of each bone of the skeleton. Contained in SUPPLEMENT **225.** Price 10 cents.

ON THE CARE OF HORSES.—BY PROF. Pritchard, R.V.S. Showing the Proper Construction of Stables. Best Floor. Lighting and Ventilation. Hay-racks. Watering and Feeding. Grooming and Exercise. Cracked Heels; Lice; Colic; Mud Fever; Wind Galls. Also, in same number, facts about improved Cow Stables. How to keep Cows clean and maintain Pure Air in Stables. Increased Cleanliness and Convenience with Less Labor. Contained in SUPPLEMENT **123.** Price 10 cents.

THE HORSE.—HIS QUALITIES AS shown by his limbs. By Richard Hugh Hilhouse. An article of great interest to all horse owners, showing by means of diagrams the correct pose, and the faults of position, so frequently met with in combination in one and the same horse. By means of the key here given, misshaped legs, misplaced feet, or bad action will be noted, and either counteracted or wholly avoided when mating since these deviations are the source of blemish and inflammation at the weakest points, and depreciate the value of the horse. SUPPLEMENT, No. **195.**

HOW TO MAKE TROUT PONDS.—With one figure. SUPPLEMENT **246**. Price 10 cents.

THE WINNER OF THE DERBY, 1880.—Portrait and performances of the trotter Bend Or. SUPPLEMENT **239.** Price 10 cents.

THE STURGEON.—DISTRIBUTION. Method of Capture. The Fishermen. Caviar. American species. The Sturgeon in harness. SUPPLEMENT **178**. Price 10 cents.

THE CARE OF HORSES.—HOW THEY should be treated in Health and Disease. SUPPLEMENT **185**. Price 10 cents.

TROUT BREEDING EASY.—BY J. T. King. Method of obtaining a family supply of the fish at small expense. SUPPLEMENT **222**. Price 10 cents.

TREATMENT OF HORSES' LEGS.—SUPPLEMENT **224**. Price 10 cents.

HOW TO TELL A HORSE'S AGE.—SUPPLEMENT **217**. Price 10 cents.

BREAKING HORSES BY ELECTRICITY as practised in France.—With one figure. SUPPLEMENT **208**. Price 10 cents.

BONELESS COD: HOW CURED AND prepared for market.—SUPPLEMENT **250**. Price 10 cents.

REASONING FACULTY IN ANIMALS.—By Joseph F. James. SUPPLEMENT **298.** Price 10 cents.

FLIGHT OF BIRDS, AND THE MEchanical Principles Involved.—By A. C. Campbell. Illustrated. SUPPLEMENT **298.** Price 10 cents.

RATS, GETTING RID OF.—SUPPLEMENT **293.** Price 10 cents.

FLOORS FOR HORSE STABLES.—SUPPLEMENT **308.** Price 10 cents.

POULTRY FARMING.—WITH FULL page illustration of rare fowls raised in Germany. SUPPLEMENT **306**. Price 10 cents.

THE WINNER OF THE DERBY.—LIKEness and performances of the celebrated trotter, Iroquois. SUPPLEMENT **290.** Price 10 cents.

POULTRY CHOLERA.—GOVERNMENT Paper on Fowl Cholera. Its prevention and cure. Valuable rules. SUPPLEMENT **298.** Price 10 cents.

DON COSSACK.—PEDIGREE AND likeness of this celebrated trotter. SUPPLEMENT **273.** Price 10 cents.

OBSERVATIONS ON THE SALMON OF the Pacific.—By D. S. Jordan and C. H. Gilbert. SUPPLEMENT **275.** Price 10 cents.

HOW TO MAKE A TRAWL.—BY T. E. Parkins With illustrations. SUPPLEMENT **269.** Price 10 cents.

WINNER OF THE DERBY AND THE Oaks.—Portraits of the trotting horses Sir Bevys and Fortune. SUPPLEMENT **185**. Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

COSMOLOGY.

Astronomy, Meteorology, Etc.

SATURN.—THE WONDER OF THE Worlds.—An exceedingly Interesting Description of the Planet Saturn. By Camille Flammarion. The immense size of Saturn, equal to 864 globes like our own · its distance from the sun and earth; its great velocity, and the period of its daily revolution. The rings of Saturn, their dimensions, and respective distances from the planet. The discovery of Saturn's rings by Galileo, and how he regarded the phenomenon. The first description of the ring given by Huyghens. How the rings were regarded by Galileo's cootemporaries. Saturn's diameter, and time of revolution around the sun. The number of days in its year. The bands of Saturn, and their variability and probable nature. The remarkable differences of density of the Saturnian globe; only three-fourths that of water, and decreasing toward the surface. The impossibility of one gaining any knowledge of the structure and molecular state of the planet. The eccentricity of Saturn with respect to its ring, and its cause The probable condition of life on Saturn. Possibility of the planet being inhabited by beings peculiarly fitted to endure the intense cold that prevails there. Fontenelle's speculations in regard to the inhabitants of Saturn. The condition of gravity at various points of Saturn's surface. Possibility that Saturn's inhabitants are fitted for an aerial life. Humphry Davy's curious speculations on this subject The nature of Saturn's rings; and the probability that they consist of distinct particles revolving around the planet with different velocities, according to their respective distances. The times of revolution of the rings around the planet as calculated by Laplace, Sir William Herschel, and the author The gradual approach of the rings toward the planet, and the possibility that they will one day fall thereupon. How the rings appear to the inhabitants of Saturn. What kind of a light is reflected from the rings to the planet. How our earth appears to the Saturnians. Illustrated with one engraving, and contained in SUPPLEMENT **192.** Price 10 cents.

THE SUN.—BY PROF. S. P. LANGley, of the Allegheny Observatory, Pa.—A valuable and instructive series of articles, giving an account of all that has been discovered in regard to our luminary up to the present date, and the means by which such discoveries have been made. Including the distance of the sun from the earth; his diameter; the sun spots, how observed, and their supposed relation to the weather. A description of a total eclipse; the chromosphere and the inner and outer coronas, and their supposed composition. The sun's surface and the apparatus for studying it; the polarizing eyepiece; the filar micrometer. The faculæ and their wonderful beauty. The spectroscope in solar work. The principle of the spectroscope explained; how the spectroscope is constructed. Descriptions of Kirchhoff's and Young's spectroscopes. How the apparatus is used. Kirchhoff's and Bunsen's maps of the spectra. Fraunhofer's latest form of the spectroscope. Mr. Rutherfurd's ruling engine. Substances found in the solar photosphere by means of the spectroscope. The sun's radiant energy. Definition of radiant energy. Different methods of measuring heat; the calorimeter of Violle; Pouillet's pyrheliometer. The temperature of the sun's surface as estimated by various physicists. The simple burning lens; the polyzonal burning lens. The immense source of power in the sun's rays, and the probability that it will at some day be utilized as a substitute for our present fuels. Ericsson's solar caloric engine, and its capacity. M. Mouchot's apparatus for utilizing the solar energy. The practical bearing of this question on the industries of the world. Illustrated with thirty-three engravings. Contained in SUPPLEMENTS **212, 214, 216, 217,** and **218.** Price 10 cents each, or 50 cents for the series.

THUNDERSTORMS.—BY PROF. TAIT. An interesting lecture, showing: The prominent features of a thunderstorm. Electricity in the air. Electricity from rain drops. The light of lightning. Motion and power of electricity. How electricity is distributed on a conductor. How lightning rods operate, and how they shou'd be connected with the soil. Lightning flashes several miles long. Effects of lightning. The nature of thunder. Globe lightning. Water the chief agent in thunderstorms. Theories as to the sources of electricity of thunderstorms. Contained in SUPPLEMENT **254.** Price 10 cents.

RECENT STUDIES AMONG THE STARS. —By Prof. Isaac Sharpless. A lecture delivered at the Academy of Fine Arts, Philadelphia, giving an interesting account of the results that have been obtained from a close study of the solar system in recent years. The variable stars. The substance of stars. The colors of the stars. Star structure. The condition of things on the surface of the stars. Sun spots and magnetic disturbances. Variations in brightness. Motions of stars. The Milky Way. Comets. The development of stars and their destruction. Contained in SUPPLEMENT **273.** Price 10 cents.

PRESENT CONDITION OF ASTRONOmical Science.—By Asaph Hall. Paper read before the American Association for the Advancement of Science, giving the present status of astronomical science, and pointing out the subjects that need fuller investigation, and to which astronomers should give more attention than heretofore Contained in SUPPLEMENT **247.** Price 10 cents. The same number contains an abstract of an interesting report to the Chicago Astronomical Society on the planet *Jupiter*, by Prof. G. W. Hough, illustrated.

NEW METHOD TO DETERMINE WIND'S Velocity, and to Test the Correctness of Anemometers.—By John H. Long. A Paper read before the Kansas Academy of Sciences. One Cut. SUPPLEMENT **110.** Price 10 cents.

METEOROLOGICAL REGISTERS.—By M. Marie-Davy. Description of the various meteorogical apparatus used at the Montsouris Observatory, embracing: The Registering Barometer, the Barograph, the Micrometer for reading curves traced by the Register, the Thermograph, the Psychrometer, the Earth Thermometer, the Actinometer, the Atmograph, and the Anemograph. Illustrated with 5 engravings of apparatus, and one diagram, showing specimens of curves made by the various registers. SUPPLEMENT, No. **198.**

CLOUDS.—BY PROF. S. A. MAXWELL. An interesting and lucid exposition of the nature, causes, and laws which govern the formation of clouds. Nature of clouds. Their classification. Process of cloud formation and transformation. The stratus. The cumulus. The cumulo-stratus. The nimbus. The cirro-stratus. The cirro-cumulus. Cirrus. Effects of clouds. Direction and motion. Importance of the study of clouds. Contained in SUPPLEMENT **260.** Price 10 cents.

VENUS, THE EVENING STAR. AN INteresting and valuable paper. By Camille Flammarion. Containing a resume, in popular form, of the latest knowledge concerning this wonderful planet, which is nearly of the same size as the earth and only twenty-six millions of miles distant from us. Including an account of the phases of Venus, its remarkable brilliancy, periods when seen in the daytime, its density, probable atmosphere, climate, physical features, deductions concerning life and inhabitants, etc., with one illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **177.** Price 10 cents. To be had at this office and of all newsdealers. The same number also contains a valuable paper by Alfred M. Mayer, on the Measurements of the Waves of Light, with a drawing and description of the mode of using the Spectrometer.

DEFINITE CONCLUSIONS OF SCIENCE. Our Earth Motionless. A Lecture Proving that our Globe neither Rotates upon its Axis nor around the Sun, delivered at Berlin, by Dr. Shœpfer. The Pendulum Experiment of Leon Foucault, and Why it is not a Proof of the Earth's Diurnal Rotation. The Centrifugal Cause of the Earth's Spheroidal Figure Rejected. Other Causes of the Spheroidal Form. Difference of Time of Vibration of Pendulum at Equator and at the Poles considered. Time of Vibration of Pendulums varies with their Weight. The Laws of the Pendulum not Exact. The Yearly Revolution of the Earth, and the Causes of the Seasons and Day and Night. Falsities in Astronomy. Sizes of the Heavenly Bodies incorrect. Distances of the Fixed Stars all wrong. The existence of an Atmosphere on the Planets Denied. SUPPLEMENT **121.** Price 10 cents.

METEOROLOGICAL APPARATUS. — Illustrations and descriptions of the instruments devised and constructed by Daniel Draper. Esq., of the New York Meteorological Observatory, for recording meteorological phenomena; comprising the Self-Recording Mercurial Barometer, the Sun Thermometer, Wet and Dry Pencil Thermometers, Direction-of-Wind Instrument, Force-of-Wind Instrument, Velocity-of-Wind Instrument, and Rain and Snow Gauge. Seven engravings. Contained in SUPPLEMENT **209.** Price 10 cents.

THE ZODIACAL LIGHT.—AN INTEResting abstract of Father Marc Dechevren's remarkable memoir on the subject of the zodiacal light, the phenomena of which have hitherto been so little understood, but are now, through the labors of this investigator, made much clearer. Illustrated with one engraving, showing the aspect and position of the zodiacal light at the winter and summer solstices and the vernal equinox. Contained in SUPPLEMENT **241.** Price 10 cents.

MARITIME METEOROLOGY. — BY Thompson B. Maury. A valuable paper for navigators, embracing: Classification of the winds of the globe. The laws governing the origin and movements of cyclones or hurricanes. Hints for handling ships in or near cyclones. Researches in ocean meteorology. Contained in SUPPLEMENT **270.** Price 10 cents.

THE GIANT OF THE WORLDS—BY CAmille Flammarion. A description of the colossal planet Jupiter; its diameter, circumference, mass, velocity, and distance from the sun and earth; the length of its days and years; the curious speculations that have been made in regard to its inhabitants; its meteorological conditions; its curious bands, their number and appearance and probable constitution; the time of the planet's rotation as ascertained by different observers; probable geological state of the planet at the present time; the probability of its being inhabited and speculations as to the nature of the beings who dwell upon it; the planet's four enormous satellites, their days and seasons, and the probability of their being inhabited; aspect of Jupiter as seen from his satellites; how the sun appears as viewed from the satellites; the earth as it must appear to the inhabitants of Jupiter. Illustrated with one engraving. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **196.** Price ten cents. To be had at this office, and from all newsdealers.

ANOTHER WORLD INHABITED LIKE our own. A most interesting description of the planet Mars and its satellites by that renowned astronomer and brilliant French writer, Camille Flammarion. The planet Mars, which comes next to the earth in order of distance from the sun, has been the object of especial study with the author, who was desirous of finding therein a confirmation of his theory of the plurality of the inhabited worlds. Some of the more important points treated of are: The atmosphere of Mars, and its clouds; the geography of the planet; its snow-clad poles; the analogy of the martial climates with those of the earth; the red color of the continents of Mars, and the green color of its seas; the author's theory that the red color is due to the peculiar hue of the vegetation of the planet; the meteorology of Mars shown to be very similar to that of the earth; Mars, like the earth, the former seat of interior geologic changes; map of Mars as constructed by the author after comparing more than 1,000 telescopic drawings, the diameter and superficial area of Mars; its density; force of gravity at its surface; beings living on Mars are necessarily only one-third as heavy as terrestrial beings; conclusions of the author that the inhabitants of Mars are fitted for flying in its atmosphere; the satellites of Mars, their minute size, and their periods of revolution. Illustrated with two engravings. SUPPLEMENT, Nos. **175** and **180.** Price 10 cents each.

DISTRIBUTION OF LAKES IN THE United States.—By Prof. John Le Conte. SUPPLEMENT **232.** Price 10 cents.

AIR THERMOMETERS, NEW.—BY D. Winstanley. With three figures. SUPPLEMENT **263.** Price 10 cents.

FOGS AND THEIR CAUSES.—BY R. A. Proctor. SUPPLEMENT **173.** Price 10 cents.

MEMORABLY COLD WINTERS.—AN interesting record. SUPPLEMENT **169.** Price 10 cents.

METEOROLOGICAL REGISTERS.—BY Marie Dary Description of the various ingenious meteorological apparatus employed in the Monsouvir Observatory. With six figures. SUPPLEMENT **198.** Price 10 cents.

NEW DYNAMIC BAROMETER.—DEscription, with two cuts. Showing details of construction. SUPPLEMENT **207.** Price 10 cents.

ORIGIN OF TEMPORARY AND VARIable Stars.—By Prof. Bickerton. SUPPLEMENT **163.** Price 10 cents.

VOLCANOES OF THE PACIFIC COAST —By S. F. Emmons. SUPPLEMENT **176.** Price 10 cents.

THE AURORA BOREALIS AND TELEgraph Cables. SUPPLEMENT **288.** Price 10 cents.

JUPITER.—BY PROF G. W. HOUGH. SUPPLEMENT **247.** Price 10 cents.

THE DISTANCES OF CLOUDS.—BY Francis Galton. Method of determining the heights and distances of clouds by their reflection in a low pool of water, and in a mercurial horizon. SUPPLEMENT **253.** Price 10 cents.

THE EARTH AS SEEN FROM THE other stars.—With six illustrations. SUPPLEMENT **252.** Price 10 cents.

URANUS.—CENTENARY OF THE DISCovery of. Illustrated. By W. F. Denning, F.R.A.S. SUPPLEMENT **303.** Price 10 cents.

RAINDROPS, HAILSTONES AND SNOWflakes.—Explanations of the phenomena by Prof. O. Reynolds. SUPPLEMENT **306.** Price 10 cents.

Geography, Geology, Etc.

CENTRAL AFRICA.—BY REV. JOHN O. Means, D.D. An exceedingly valuable and interesting article, giving in a condensed form an immense amount of information in regard to Africa in general, and to the central portion in particular—that portion concerning which our knowledge is so imperfect; describing the geological and physical formation of the country, its climate, its products, its inhabitants, and their customs and habits, and showing what is now being done by various nations to open up this rich region to commerce. Illustrated with a map of Africa. Contained in SUPPLEMENTS **208** and **209.** Price 10 cents each.

IGNEOUS ROCKS.—AN ADDRESS TO the Geological Section of the British Association, 1880. By H. Clifton Sorby, LL.D. An important geological paper. Contained in SUPPLEMENT **255.** Price 10 cents.

THE TREELESS PRAIRIES OF THE West.—By Thomas Meehan. SUPPLEMENT **298.** Price 10 cents.

ASCENT OF CHIMBORAZO AND COTOpaxi.—An exceedingly interesting paper read very recently before the Society of Arts London, by Edward Whymper, giving an account of the author's ascent of the two lofty volcanoes Chimborazo and Cotopaxi, for the purpose of settling the disputed question whether man can become so habituated to the low pressure existing at such heights as to be able to live there without inconvenience and do useful work. The author's account of his voyage contains much geographical and ethnological information that is not generally known. Contained in SUPPLEMENTS **277** and **278.** Price 10 cents each.

MODERN PALEONTOLOGY, ITS PRESent Condition and Future Task.—By Prof. Carl Vogt An interesting paper, in which the author passes in review the beings that lived in earlier times, and points out the proper method of studying them at the present day, and that, too, in a manner essentially different from the one usually followed, inasmuch as he tries to prove the relation between the extinct types and the modern representatives of the organic world, which he claims can be proved by generation and descent without calling in the intervention of a special power of creation existing separate from the organisms. A powerful argument in favor of the doctrine of evolution. Contained in SUPPLEMENTS **249** and **250.** Price 10 cents each.

THE FOSSIL FOREST OF THE YELLOWSTONE NATIONAL PARK. By W. H. Holmes. A very interesting and valuable paper descriptive of the remarkable "Volcanic Tertiary" formations of the above region, 5,500 feet in thickness. Illustrated by an engraving of the north face of Amethyst mountain, 9,400 feet high, the river bed 6,700 ft. high, showing the position of the multitudes of ancient forest tree trunks of gigantic size turned into stone, and now standing on the cliffs, together with many other interesting geological particulars. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **180.** Price 10 cents.

THE GEOLOGICAL ANTIQUITY OF Flowers and Insects.—By J. E. Taylor, F.G.S. A plain, comprehensive review of the subject, bringing forward many instructive facts; with six illustrations. The invariable correlation between insects and flowers. How they are fossilized. Fossil Botany. Geological Evidences of Evolution. Correspondence in the succession of Animal and Vegetable life. Flowers necessary to Insects, and Insects necessary to Flowers. Insects and Plants in the Devonian, the Switzerland Lias, the English Stonefield Slate, the Tertiary Strata, the Coal Measures, a Greenland and other formations. A Peculiar Aspect of Evolution. SUPPLEMENT **120.** Price 10 cents.

THE CAÑONS OF THE COLORADO.— Compiled from the Report of Prof. J. W. Powell, Geologist in charge of the Geographical and Geological Survey of the Territories. With Forty-eight Engravings. History of the Original Exploration. A peculiarly Exciting and Dangerous Voyage. Strange and Gigantic Scenery, with Engravings of Green River; Parunuweap Canon; Gate of Lodore: Marble, Gypsum, Kanab, and Grand Canons; Mouth of the Little Colorado; Geography of the Colorado River Basin, with large Map. Strange Geological Features; the Buttes, the Bad Lands, the Hog-back Valleys, the Terrace Cliffs, and description of Faults and Folds. Land of Standing Rocks, Island Monument, Grottoes, Towers, Amphitheaters, and Caves. Stupendous Denudation by Rains; Mountains Carved from Level Plains. A Land of Grotesque Monuments, and its Strange Geological History. With brief account of the Indians of the region and their habits, and of the Interesting Archæological Relics of an Ancient Unknown Race. SUPPLEMENTS **118, 121, 124, 131, 135.** Price 10 cents each.

MT. RANIER OR TAKHOMA.—A DEscription by Hazard Stevens of his ascent of this remarkable Volcano in Washington Territory. This narrative, of absorbing interest to both the Naturalist and the general reader, gives the Geography of the region; the Toils, Perils, and Adventures of the expedition; Discovery of a Cavern in the Crater; A Night in the Volcano; The Stupendous Glacial System of the Mountain and the vast River it Feeds. SUPPLEMENT **59.** Price 10 cents.

ANCIENT LIFE IN AMERICA. — AN address, by Prof. O. C. Marsh, recently delivered before the American Association for the Advancement of Science, Nashville, Tenn. Prof. Marsh, who is so widely known for his remarkable Western Discoveries, especially of American Fossils, presents in this address a connected history of the dawn and progress of Life in America, as shown by the latest deductions of Science, and confirmed by his extraordinary Geological Collections. This paper is full of fresh information, and forms one of the most interesting and valuable contributions to science ever given to the public. SUPPLEMENTS **90** and **91.** Ten cents each.

DIAMONDS AND OTHER PRECIOUS STONES.—The Diamond Fields, Entertaining History of the Regent, the Koh-i-noor, and other famous stones. Sapphires, Rubies, Topazes, Emeralds, Beryl, Aquamarine, Cymophane, and Turquoise. Corundum, Rock Crystal, Amethyst. The remarkable ingenuity expended in producing false stones. Their Tests, etc. SUPPLEMENT **104.** Price 10 cents.

GEOLOGY. — INAUGURAL ADDRESS of President Andrew C. Ramsay at the annual meeting of the British Association for the Advancement of Science, August, 1880. A most valuable and interesting paper, showing some of the latest researches in Geology, and the important deductions therefrom resulting. Contained in SUPPLEMENT **248.** Price 10 cents.

EVIDENCES OF THE AGE OF ICE.— By Henry Woodward, F.R.S. An able and Instructive Essay, with five illustrations, enumerating the present climatic variations, the Geological and other Proofs of the Glacial Epoch. Description of the Age of Ice as still seen in Greenland and upon the Alps, etc. Migrations of Man and Animals during climatic changes. Astonishing Volcanic Disturbances, and their bearing on Temperature. SUPPLEMENT **76.** Price 10 cents.

CATASTROPHISM. — BY CLARENCE King. Address delivered before the Sheffield Scientific School, Yale College. Catastrophism and Evolution. Uniformitarianism. America formed by Catastrophes. Field Records of Catastrophes. Importance of Environment. SUPPLEMENTS **80** and **81.** Price 10 cents each.

POLYDACTYL HORSES, RECENT AND Extinct.—By Prof. O. C. Marsh. A valuable paper, illustrated with 10 engravings showing the comparative morphology of the teeth and anatomy of the feet of recent and extinct horses. SUPPLEMENT, No. **188.** Price 10 cents.

HISTORY AND METHODS OF PALÆontological Discovery. Address delivered at the Saratoga Meeting (1879) of the American Association for the Advancement of Science. By Prof. O. E. Marsh, President. An important and valuable paper. SUPPLEMENT, Nos. **193** and **194.** Price 10 cents each.

GEODETIC SURVEYS.—BY PROF. L. M. Haupt. With one figure of an easily constructed heliotrope. SUPPLEMENT **163.** Price 10 cents.

UNDERGROUND SURVEYING :—NEW Instrument the With three figures. SUPPLEMENT **271.** Explaining ts.

THE DISCOVERY OF UNDERGROUND Springs.—By Daniel Ramée. Explaining the principles of the art of tracing underground veins of water. With one figure. SUPPLEMENT **269.** Price 10 cents.

THE SALTPETER CAVES IN VIRGInia.—By H. Haupt, Jr., M.D. SUPPLEMENT **184.** Price 10 cents.

THE GEOLOGICAL HISTORY OF THE North American Flora.—By J. S. Newberry. SUPPLEMENT **245.** Price 10 cents.

THE GEOLOGY OF COAL.—BY PROF Green. SUPPLEMENT **173.** Price 10 cents.

TEXAS IN ITS GEOGNOSTIC AND Agricultural Aspect. By J. Boll. SUPPLEMENT **180.** Price 10 cents.

ROPINESS IN BEER.—ITS CAUSE AND Prevention. SUPPLEMENT **195.** Price 10 cents.

ASCENT OF CHIMBORAZO AND COTopaxi. By Edward Whymper. SUPPLEMENTS **277** and **278.** Price 10 cents each.

EXPERIMENTAL GEOLOGY. — THE artificial production of calcareous pisolites and oolites.—With one figure. SUPPLEMENT **286.** Price 10 cents

BIOLOGY, ETC.

Zoology.

THE CARPET BEETLE AND OTHER domestic insect pests.—An interesting and instructive paper read by Dr. H. A. Hagen before the Boston Society of Natural History. Giving the complete natural history of the new carpet beetle, where it came from originally, how it has spread, its destructive habits, and how its ravages may be prevented. A description of the Attagenus Megatoma—a new relative of the carpet beetle, just as destructive, and which, although not well known to the public, is really equally as common as the latter. The Common Flea and its rapid increase during the last few years. The recent increase in the number of Cat Fleas and the annoyance that they have caused housekeepers in the Eastern States. Fleas in Poland and the remedy against them in that country. Polish Flea-traps described. The present variety of the Hessian Fly and Wheat Midge. How insects, like plants, are introduced into and distributed through new countries. The home of the Cockroach, and the insect's immigration westward. The introduction of plants and insects by emigrants, and the gradual change of a country's insect fauna by a change of its flora. Butterflies that have made the trip around the world. Insects constantly brought from Europe by steamers; the grain weevil, the rice weevil, and the asparagus beetle. Contained in SUPPLEMENT **161.** Price 10 cents.

PYRETHRUM THE BEST INSECT KILler.—Directions for raising the plant. Effects of the powder on various insects. Effects of the fumes of burning Pyrethrum. SUPPLEMENT **247** Price 10 cents.

HOW THE CHAMELEON CHANGES Color.—With Four cuts. SUPPLEMENT **157.** Price 10 cents.

LIGHT-EMITTING ANIMALS. — BY Prof. Martin Duncan, F.R.S., etc. A paper descriptive of the various lower forms of animal life which have the power of emitting phosphorescence. The anatomy and the luminosity of Noctiluca. Phosphorescence of the Hydrozoa, Medusæ, and Actinidæ. The extraordinary luminosity of the Algyonarian, Pennatulidæ, and Gorgonidæ. Pauseri's interesting studies of the latter. The grand display of phosphorescence in the pyrosoma; anatomy of the animal. Pholas and its light. Luminosity of the sea-slug phyllirhoe, and of some of the ophiurians. Luminous crustacea. Certain light-emitting myrapods. The grand luminosity of the two families of beetles—lampyridæ and elateridæ. The probable causes of animal luminosity. Illustrated with twelve figures. Contained in SUPPLEMENT **197.** Price 10 cents.

EYE-LIKE SPOTS IN FISHES.—ILLUStrated. By Prof. F. Jeffry Bell, M.A. SUPPLEMENT **301.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Zoology.

SILK-PRODUCING BOMBYCES Reared in 1880.—A valuable paper by Alfred Wailly, detailing the results of the author's experiments during the year 1880 in rearing and acclimating in England various genera and species of exotic silkworm moths, and giving some practical suggestions on collecting and rearing these insects, and on packing the living cocoons and pupæ for shipment. Contained in SUPPLEMENT **282.** Price 10 cents.

ON NOCTURNAL ANIMALS. — BY James Murie, M.D., F.L.S. An explanation of some of the peculiar phenomena observable among nocturnal birds and mammalia, preceded by a consideration of the senses and sensory organs of a few of the inferior invertebrata. The sarcode of the protozoa and its sensitiveness to impressions. Medusæ and their rudimentary sensory organs. Sea-blubbers and their extreme sensitiveness to light. The preference for darkness as shown among the Annelids. Some nocturnal Mollusca and Crustacea. Arachinda, Myriapoda, and insects that carry on their life occupations in darkness. The nocturnal habit of one creature shown to superinduce the necessity of similar habit in the other. The enemy of one must stir betimes to seek its prey, and thus from class to class the nocturnal habit is transmitted. Nocturnal birds. The Apteryx and its habits. The New Zealand Night Parrot. The Western Ground Parakeet. The Owls. The Nightjars. Mammals: The Cat Tribe. The Grysbok. The Elephant and Tapir. The Star-nosed Mole. The Bats. The Vampires. The Lemur. The Potto or Bush Dog, and the Slow Loris. The Great-eared Javan Tarsius, African Galagos, and Great-eared Aye-Aye of Madagascar. The Douroucouli. Summary of the points which doubtless influence nocturnal habits in animals to some extent. Illustrated with three engravings. Contained in SUPPLEMENT **199**. Price 10 cents.

EELS. — A VERY CHAS. COMPLETE article on the subject of these portant food fishes, giving their natural history, the mode of fishing for them, and many other interesting details in regard to them. Our present knowledge of the eel. Origin of the Oswego River Industry and its History. Fulton. Horse-shoe Dam. Jack's Rifts. Caughdenoy. Physics of the river. Fishing apparatus. Sex in eels. Spawning grounds. Scarcity and plenty. Food of eels. Eels as food. Natural History Notes. Contained in SUPPLEMENT **266**. Price 10 cents.

THE SILKWORM.—A BRIEF MANUAL of Instructions for the Production of Silk. By Prof. C. N. Riley, explaining the Nature of the Silkworm; describing its Four different States of Egg, Larva, Chrysalis, and Imago; pointing out the Enemies and Diseases of the Insect; describing the Varieties or Races of the Silkworm; telling how the Eggs should be Wintered and Hatched, and the Worms Fed and Reared; showing how the Worms prepare for Spinning, how the Cocoons should be Gathered, and how the Chrysalids should be Choked. Describing how the Reeling of the Silk is to be performed, and concluding with a Dissertation and the proper Food Plants for the Silkworm. Illustrated with 8 engravings. SUPPLEMENT, Nos. **174, 175.** Price 10 cents each.

THE NORWEGIAN LEMMING AND ITS Migration.—By W. Duppa Crotch, F.L.S. A highly interesting Description of the animal, with an account of its astonishing periodical Migrations westward into the Atlantic Ocean, whereby myriads of these creatures voluntarily drown. The Lemming on its travels; its numerous enemies, and its pugnacity. How it Lives in Winter under the Snow. Its Widespread Destructiveness. Probable Cause of these Suicidal Migrations. Singular Proof of the former existence of the sunken continent Atlantis. Also, in same SUPPLEMENT, the Intelligence of Ants, etc. SUPPLEMENT **75.** Price 10 cents.

REARING OF A SILK-PRODUCING Moth.—By A. L. Clement. An interesting account of the Author's Observations and Experiments in rearing from the egg to the perfect state, the large silk-producing moth, *Attacus cecropia*; being a complete life history of the insect. Describing the mode of deposition of the eggs and their size and shape; size, color, and markings of the Caterpillar at the time of hatching and at each of its five moults; the dimensions, shape, color, and peculiarities of the Cocoon. The quality and commercial value of the silk; and the aspect of the beautiful Moth which eventually issues from the Cocoon. This silk worm may be raised on the plum tree. Illustrated with three engravings representing every stage of the moth. Contained in SUPPLEMENT **201.** Price 10 cents.

ANTHROPOID APES.—A VERY COMprehensive account of the habits of baboons and orang-outangs as they have been studied both in a state of nature and of captivity. Mr. Moseley's notes on the baboons which he observed in South Africa. Interesting account of the habits of the two orangs at the Garden of Acclimatization, with eleven cuts, illustrating the text, and one full page engraving giving a faithful portrait of the animals. Mr. Hornaday's valuable notes on the orangs of Borneo, read at the recent meeting of the American Association for the Advancement of Science. Contained in SUPPLEMENT **205**. Price 10 cents.

THE FLIGHT OF BIRDS.--BY A. C. Campbell. An interesting paper, in which the author explains the structure of the bird's wing, and the mechanical principles involved in flight, and from thence shows how the bird contrives to sustain itself against gravity and to acquire any desired speed. Illustrated with seven cuts. Contained in SUPPLEMENT **298**. Price 10 cents.

THE EARLIER MIGRATIONS OF ANImals and their Relation to the Present Distribution of Animals.—By Carl Vogt. An important contribution to our knowledge of existing animal life, in which the author seeks to show that the geographical distribution of nearly related animals found in regions remote from each other is not to be accounted for on the theory of migrations; but that there is more reason to believe that it is the result of a development which took place simultaneously in different quarters of the globe from certain types, which have finally produced forms that are very closely related to one another. Contained in SUPPLEMENT **262.** Price 10 cents.

THE HERRING.—A LECTURE DELIVered by Prof. Huxley at the National Fishery Exhibition, Norwich, April, 1881, giving a summary statement of what is now known regarding this important fish. Characteristics of the herring. Its food. Its ancestry, allies, and relatives. Propagation. Spawning and development of the young. Abundance of the fish and its geographical distribution. Relative abundance. Contained in SUPPLEMENT **285.** Price 10 cents. The same number contains two other important articles on allied subjects: "The Shad Fishery of the Atlantic Coast," and "The Relative Food Value of Fish."

THE HORSE BOT-FLY.—A COMPLETE life history of this dreaded horses' pest, from the egg state up to the perfect fly; followed by a short life history of another allied foe of the horse—the Hemorrhoidal Bot-fly. Illustrated with twenty-four figures of the flies as seen at different periods of their transformations. Contained in SUPPLEMENT **212.** Price 10 cents.

THE REASONING FACULTY OF ANImals.—By Joseph F. James. An interesting paper, in which the author contends that instincts in animals are not of divine origin, but come into existence in obedience to natural laws, and in many cases ought to rank with the reason of man. Contained in SUPPLEMENT **298.** Price 10 cents.

SCALE INSECTS.—BY PROF. COMstock. Natural history of the scale insects. The Forms of Scale Bugs which occur on the Pacific Coast. How the Scale Insect is Spread. Methods of Preventing the Pest and Remedies for Exterminating it. The Smut Fungus associated with Scale Insects on Orange Trees and Oleanders, and what Causes it. How to destroy the Fungus. Contained in SUPPLEMENT **261.** Price 10 cents.

FELONS.—BY T. C. BRANNON, M.D. —A simple treatment for aborting this painful disease, and which has been used with great success by the author for the last twenty-three years. How to diagnose a felon. Treatment. Contained in SUPPLEMENT **243.** Price 10 cents.

THE PREPARATION OF SKELETONS for Museum Purposes.—By Prof. W. H. Flower, F.R.S. Simple Practical Directions giving the several Methods. SUPPLEMENT **106.** Price 10 cents.

THE ENEMIES OF BOOKS. THEIR NATural History, their Ravages. How to Destroy Them. The Cockroach, the Deathwatch, the Weevil, the Tabby Moth, the Sugar Louse, the Brazilian Traça, and their Larvæ, described and illustrated with twelve figures. SUPPLEMENT **138.** Price 10 cents.

CHAMELEONS.—BY PROF. J. REAY Greene, F.L.S. A very complete and interesting account of this singular family of reptiles; describing their remarkable characteristics as exhibited in the structure of their eyes and tongue and wonderful changes of color; their mode of life in a state of nature, and habits in captivity; classification, and geographical distribution. Illustrated with six figures. Contained in SUPPLEMENTS **233** and **234**. Price 10 cents each.

THE PHYLLOXERA. THE COMPLETE Life History of this curious and destructive insect, as worked out by Prof. C. V. Riley in America and M. Balbiana in France. Illustrated with 10 engravings, showing all the phases of the insect from the egg to the perfect animal. The two types—Radicola and Gallæcola—of the Phylloxera. The Vine Phylloxera a polymorphic species. The sedentary females which live on the roots of the vine; their immense numbers, and their subterranean travels from one vine to another. The change of certain sedentary females into winged, migratory females. The deposition of eggs by the latter on the aerial parts of the vine. The sexed individuals that are hatched from these eggs. These individuals wingless and short lived; they do not eat, but occupy themselves solely with reproduction. The female lays but a single egg, then dies. The agamic wingless female issuing from this egg again begins the cycle of phylloxeric life. The problem to be solved in preventing an invasion of the pest is to destroy the winter egg. The minute size of the latter and the different methods that have been devised to discover and destroy it. Recipe for an approved insecticide, and how it is to be used. Resumé of the life of the Phylloxera, by Prof. Riley. SUPPLEMENT, No. **167.** Price 10 cents.

THE EYE-LIKE SPOTS IN FISHES.— By Prof. F. Jeffrey Bell, M.A. With six figures. SUPPLEMENT **301.** Price 10 cents.

THR ARMY WORM.—NATURAL HIStory of, and modes of extermination. With one illustration. SUPPLEMENT **306.** Price 10 cents.

NOTES ON THE MIGRATION OF BIRDS. —By H. D. Minot. SUPPLEMENT **310.** Price 10 cents.

DIPTERA AS SPREADERS OF DISEASE. —By J. W. Slater. SUPPLEMENT **303.** Price 10 cents.

INSECTICIDES.—BY DR. H. BEHR. SUPPLEMENT **308.** Price 10 cents.

Botany.

HISTOLOGY AND THE CELL-THEORY. —By Dr. Edouard Fournié. Examination of Germany's Claims in Microscopy. De Mirbel, Turpin, Raspail, Duvernois, Coste, and others, and the History of the Cell-Theory. Fundamental Principles of the Theory according to Schwann. Labors of Vogt, Bergmann, Vogel, Goodsir, Kolliker, Luschka, Bischof, and Donders. M. Virchow's ideas. The Analogies in the Vital Manifestations of Organisms and Unicellular Animals. The Essential Point in the inquiry. Cells Live, but do not Perform Function. The Ovule and the Cell. The Question of Geometric Form. The famous Cellular Territories. Nutrition not Permanent. Irritation necessary to Nutrition. Contained in SUPPLEMENTS **137, 140, 142, 144.** Price 10 cents each.

THE DEVIL BEANS OF MEXICO.—BY J. W. A. Wright. An investigation into the singular Voluntary Movements of these seeds. What causes them. With 9 illustrations. SUPPLEMENT **106.** Price 10 cents.

THE FERNS OF THE PACIFIC COAST. —By Mrs. S. A. P. Lemmon. An interesting paper read before the San Francisco Academy of Sciences. The Origin of Ferns. The Life of a Fern. Sporangia and their cell walls. Modes of development. Peculiarities of the Fern Frond. Geographical range of Ferns. Peculiarities of Distribution. Some New Ferns of the Pacific Coast. Little-known Ferns. Uses, Benefits, etc., of Ferns. Fern Literature. Contained in SUPPLEMENT **283.** Price 10 cents.

CORK AND CORKS.—BY H. G. GLASSPOLE. The cork oak. Method of stripping the bark. Manufacture of Corks. Ancient uses of corks. Corks employed in medicine. Chemistry of cork bark. SUPPLEMENT **185**. Price 10 cents.

THE BEAN.—BY LOUISA REED STOWell. A microscopic study of one of the most common adulterations of wheat flour. Illustrated with camera lucida drawings, showing cross section of the coats of bean; outer coat of bean; second coat of bean; bean starch after being baked as bread; bean starch after being boiled as pudding; and cells of beans loaded with starch and gluten. An invaluable paper to those engaged in the investigation of food adulterations. Contained in SUPPLEMENT **246.** Price 10 cents.

OBJECTS OF SEX AND OF ODOR IN Flowers.—By Thomas Meehan. Contained in SUPPLEMENT **194.** Price 10 cents.

ON THE FERTILIZATION OF THE Yucca.—A paper read before the American Association, August, 1879, by Professor Thomas Meehan, showing that the elaborate and wonderful ingenuity of the Yucca Moth in applying pollen to the plant for the purposes of fertilization as described by scientists is wholly unnecessary; and that, moreover, former assertions in regard to this matter are more or less erroneous, and not supported by facts. Contained in SUPPLEMENT **195.** Price 10 cents.

A BOTANIST IN SOUTHERN CALIFORnia.—By Joseph F. James. An interesting account by a well-known botanist of his herborizations amidst the magnificent vegetation of California; with an enumeration and popular description of some of the more beautiful and characteristic plants observed by him. Contained in SUPPLEMENT **240.** Price 10 cents.

THE VARIOUS SPECIES OF RHUS, and their Beneficent and Toxical Effects.—By Dr. T. J. W. Burgess. Botanical description and properties of the different species of a genus of plants which, whether considered with reference to their beneficent or toxic effects on the human race, should be known to every physician: Rhus cotinus; Rhus coriaria; Rhus succedanea; Rhus metopium; Rhus semi-alata; Rhus aromatica; Rhus globra; and Rhus toxicodendron. Contained in SUPPLEMENT **273.** Price 10 cents.

FRAGRANT WOODS.—BY P. L. SIMmonds. An exceedingly interesting and comprehensive account of the various woods of the world which have fragrant properties; giving their botanical origin, the country from whence obtained, and the purposes for which they are used. Contained in SUPPLEMENT **172.** Price 10 cents.

MEDICINAL PLANTS.—CULTIVATION of, in Lincolnshire. Peppermint. Dill. Caraway. Rosemary. Henbane. Belladonna. Aconite, etc. By E. M. Holmes, F.L.S. SUPPLEMENT **304.** Price 10 cents.

WAR UPON INSECT PESTS.—SUPPLEMENT **298.** Price 10 cents.

EUCALYPTUS GLOBULUS.—SUPPLEMENT **298.** Price 10 cents.

Microscopy.

A STUDY OF WHEAT. BY MRS. LOU Read Stowell, of the Microscopical Laboratory of the University of Michigan. An article of sterling and permanent value, not only to millers, for whom it was more especially written, but to microscopists and scientists generally; giving the botanical and natural history of wheat, an account of the weeds and parasites that infest it, and minute account of the microscopical structure of the plant as worked out by the author herself. Describes the cellular structure of the stem; its vascular bundles, spiral vessels, pitted vessels, parenchymatous cells, and its epidermis with stamata. The structure of the grains, its pericarp or three fruit coats, its two seed coats, its albumen, and its embryo. What is meant by the "bran." The hairs at the end of the grain, and the gas that fills their central cavity. The possibility that mill explosions may be due to the escape of this gas. The canals and spiral vessels that are found in their fruit coat. The coloring matter of the seed-coat and its influence on the color of the flour. Directions for those who desire to make microscopic examinations for themselves. The albumen—the part of the wheat that is of most interest to millers; its granular cells and walls of cellulose, and its starch cells. A diagrammatic view of the "bran" of wheat. Wheat grains as seen in cross-section. The microscopic appearance of starch of wheat, the composition, mode of formation, and characteristics of wheat and other starch. The text of this very instructive paper is illustrated with 14 engravings after figures drawn by the author from the microscope. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **159, 172, 178.** Price 10 cents each.

ZIRCONIA FOR THE OXY-HYDROGEN LIGHT.—By John C. Draper. The Difficulties attending the use of the Calcium Light for projecting Magnified Representations upon a screen from the Microscope. The success obtained by the substitution of a Zirconia Cylinder for the Calcium. What Zirconia is, and complete directions for preparing Cylinders. SUPPLEMENT **93.** Price 10 cents.

INDIAN CORN.—BY LOUISA REED Stowell. A microscopical examination of Indian Corn, showing internal structure of kernels, structure of starch grains, etc., and accompanied by a concise description of this valuable grain, giving its chemical composition, its properties as a nutriment, and the various forms under which it appears in market. Illustrated with six figures. Contained in SUPPLEMENT **237**. Price 10 cents.

PROGRESS OF BACTERIA INVESTIgation.—By G. Marpmann. A valuable summary of the principal observations and theories of recent years concerning bacteria. Recognition, form, and preservation of bacteria. Physiology of bacteria. The manner in which bacteria enter the body, and their action as bearers of infectious diseases. The Results of bacterial science. Illustrated with twelve figures, showing apparatus used in studying bacteria, and views of various disease-producing bacteria as seen under the microscope. Contained in SUPPLEMENT **304**. Price 10 cents.

TEXTILE FIBERS UNDER THE MICROscope.—Showing, by the aid of figures drawn from the microscope, the distinctive characters of the leading textile fibers—silk, wool, and cotton—and pointing out what the silk fiber is and how it should be handled in order to make it as valuable as the silks of Italy or France. With nine figures of highly magnified fibers. Contained in SUPPLEMENT **292.** Price 10 cents.

POLLEN.—BY W. G. SMITH. ILLUSTRAtions and descriptions of 93 varieties of Pollen from well-known plants, and the hybrids between these curious forms. SUPPLEMENT **62.** Price 10 cents.

WHEAT AND WHEAT BREAD.—BY H. Mège-Mouriès. A study of the anatomical structure and chemical composition of the wheat grain, describing the microscopical structure and constituents of the envelopes of the grain; the envelopes and tissues of the grain proper; the endosperm or floury portion; the embryo and the coating of the embryo. The cerealine of the embryous membrane. The phosphates in the teguments adjoining the floury mass. With an engraving, showing a magnified section of a grain of wheat. Contained in SUPPLEMENT **275.** Price 10 cents.

MICROSCOPIC CRYSTALS CONTAINED in Plants.—By W. K. Higley. An elaborate study of the occurrence, forms, distribution, and composition of the raphides, sphæraphides, and crystal prisms found in the various parts of plants, based on the author's examination of over seventy natural orders of flowering plants and seven orders of cryptogams. Contained in SUPPLEMENT **257**. Price 10 cents.

THE DETECTION OF FORGERIES BY the Microscope.—A new method. By Prof. J. H. Wythe. SUPPLEMENT **258.** Price 10 cents.

FILARIA IN THE EYE.—BY CHAS. S. Turnbull, M.D. A valuable contribution to the subject of Helminthology, giving a complete and minute account of a living worm found in the eye of a horse (the third case only which is known to have occurred in this country); along with a full bibliography of the subject of this class of parasites, some of which occasionally inhabit the human eye. Illustrated with four figures of the Filaria worm. Contained in SUPPLEMENTS **168** and **169.** Price 10 cents each.

PLANT AND ANIMAL LIFE.—BY PROF. A. R. Grote. A highly instructive and interesting lecture, illustrated with 20 engravings, and giving in a popular style a full exposition of the phenomena of Life from its first manifestation in the very lowest organisms up to its perfect development in man. Plants and animals made out of the atmosphere. Life invariably associated with motion. The development of life. Protoplasm. Growth of plants and animals. Organisms that are neither plants nor animals. Æthalium. Difference between plants and animals. Spontaneous generation. Bathybius. Protamæba. Multiplication of Fresh Water Amæba. Growth of Red Snow. Structure and growth of Bryopsis. Description of Euglæna. Eggs of the higher animals have first the Amœba form, and subsequently divide like Euglæna; what the ultimate stage is to be, whether Euglæna, Amœba, fish, bird, dog, or man, not to be determined from the organic contents of the original egg itself. Science in detecting the process of evolution asserts the unity of all Nature. II.—Cell formation. All eggs are but specialized cells. Development of the Sponge. Cell development as it appears in the class of worms. Development of the tape worm. The higher worms—the Ascidians and their embryos and larvæ. Vertebrates with no skull, nor brain, and no true heart; the Amphioxus and lamprey. Description of the Amphioxus. Origin and development of the nervous system. The relative ranks of animal groups influenced by the forms assumed by species in their development. The Common Crab, its zœa and megalops stage. The Toad and its transformations. Comparative structure of the legs of the toad and bird, and the wing of the latter. Ancient birds with teeth. The succession of animals in geologic ages. The more fossils we find, the more clearly the history of the gradual development of present species is made out. The differences now found between birds and reptiles at one time did not exist. Development of the brain. Evolution of the horse. Evolution of man; he passes in his embryology through changes in which he resembles all existing animals. Experiments in transforming the Mexican Axolotl. The brain, the nerves, instinct, and reason. No nerves, no mind. Difference between instinct and reason one of degree, not of kind. SUPPLEMENT, **179** and **185.** Price 10 cents each

BACTERIA INVESTIGATION.—ILLUStrated. By G. Marpmann. SUPPLEMENT **304.** Price 10 cents.

CATCHUP UNDER THE MICROSCOPE. —By W. G. Smith. Illustrated. SUPPLEMENT **310.** Price 10 cents.

EFFECTS OF CARDING AND DRAWING Processes on Cotton Fibers.—Illustrated. SUPPLEMENT **300.** Price 10 cents.

MILDEW AND MOULDS.—BY A. G. Field, M.D. SUPPLEMENT **308.** Price 10 cents.

Biography.

BIOGRAPHICAL SKETCH OF AN INFANT.—By Charles Darwin. An interesting Biological study. Reflex Actions; Dawn of Reason and Emotion; first indication of the Moral Sense; Acquisition of Language, etc. SUPPLEMENT **86.** Price 10 cents.

MARIE JOSEPH JACQUARD. — BY Hugh McCall. A review of the life, labors, and genius of one who handed his name down to posterity by the invention of the loom which bears his name. Contained in SUPPLEMENT **254**. Price 10 cents.

GEORGE STEPHENSON.—AN INTERESting and comprehensive sketch of the life and labors of the Father of Railways. Illustrated with a portrait; a view of his birthplace; the first railway suspension bridge erected over the Tees; the Experiment railway coach—common car; the first railway coach, "Experiment;" the first locomotive, the "Rocket;" and cut showing difference between the earliest and latest locomotives. Contained in SUPPLEMENT **290.** Price 10 cents.

JOSEPH HENRY.—A EULOGY ON THE life and labors of Prof. Henry, delivered before the American Association for the Advancement of Science, by Prof. A. M. Mayer; giving an interesting account of his first and second great discoveries in electrical science; a brief statement of his subsequent researches; and many anecdotes illustrative of his character. Contained in SUPPLEMENT **247**. Price 10 cents.

CYPRIEN M. TESSIE DU MOTAY.—BY Auguste J. Rossi. A critical review of the life and labors of this distinguished savant, who has left a lasting impression on the history of industrial science, from the results of his researches in metallurgy, glass-etching, photography, the electric light, chemistry, illuminating gas, bleaching, artificial ice, etc. Contained in SUPPLEMENT **266.** Price 10 cents.

ROBERT WILHELM BUNSEN. — BIOgraphical sketch and portrait of this celebrated chemist, with a review of his contributions to science. Contained in SUPPLEMENT **289.** Price 10 cents.

GEORGE JAMES SNELUS, THE METallurgist.—An account of his life and researches; with portrait. SUPPLEMENT **262.** Price 10 cents.

FRANK T. BUCKLAND, THE NATURalist and Pisciculturist —Biography and portrait. SUPPLEMENT **268.** Price 10 cents.

PROF. L. PASTEUR.—PORTRAIT AND Biographical sketch. SUPPLEMENT **310**. Price 10 cents.

FERDINAND DE LESSEPS.—A SHORT account of his works, with full page portrait of himself and family. SUPPLEMENT **270.** Price 10 cents.

THOMAS ALVA EDISON.—BIOGRAphical Sketch, with Portrait.—SUPPLEMENT **309.** Price 10 cents.

PROF. ASA GRAY.—THE EMINENT American Botanist. Biographical Sketch. With Portrait. SUPPLEMENT **267**. Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealer. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Biography.

WILLIAM HARVEY, THE DISCOVERER of the Circulation of the Blood.—With portrait and an illustration of an event in his life. SUPPLEMENT **168.** No. **160** contains an illustrated account of the discovery, in 1879, of Harvey's remains. Price 10 cents each.

JEAN JOSEPH LEVERRIER.—BIOGRAphical Sketch, with figure of bust, executed by the sculptor, Préault. SUPPLEMENT **181.** Price 10 cents.

MADAME SOPHIE BLANCHARD, THE Celebrated Aeronaut.—Biographical sketch and portrait. SUPPLEMENT **195.** Price 10 cents.

SIR ROWLAND HILL, THE EMINENT, Social and Administrative Reformer.—Biographical sketch and portrait. SUPPLEMENT **198.** Price 10 cents.

VIOLLET LE DUC, THE GREAT French Architect.—Biographical sketch and portrait. SUPPLEMENT **202.** Price 10 cents.

FRANCOIS ARAGO.—BIOGRAPHICAL sketch, with illustration of statue erected to his memory at Perpignan. SUPPLEMENT **204.** Price 10 cents

PROF ASA GRAY, THE EMINENT American Botanist.—Sketch of his life and labors, with portrait. SUPPLEMENT **207.** Price 10 cents.

PROF. A. E. NORDENSKJOLD, THE Swedish Arctic Explorer.—Portrait and sketch of his life and labors. SUPPLEMENT **209.** Price 10 cents.

LUIGI GALVANI, THE ILLUSTRIOUS Physicist.—Illustration of statue erected to him at Bologna; with a sketch of his life. SUPPLEMENT **224.** Price 10 cents.

GENERAL ARTHUR MORIN, THE Eminent Mechanical Engineer.—Short Biographical sketch, with portrait. SUPPLEMENT **228.** Price 10 cents.

BERNHARD VON COTTA, THE GEOLOgist.—Sketch of his life and labors. with portrait. SUPPLEMENT **229.** Price 10 cents.

PAUL BROCA, THE DISTINGUISHED Anthropologist.—Biography and portrait. SUPPLEMENT **253.** Price 10 cents.

DENIS PAPIN, ONE OF THE EARLIEST Experimenters on Steam and Air.—Sketch of his life and labors; with illustration of bronze statue erected to his memory at Blois. SUPPLEMENT **254.** Price 10 cents.

ANTOINE CESAR BECQUERAL, THE Celebrated French Physicist. Sketch of his life labors, with portrait. SUPPLEMENT **259.** Price 10 cents.

Anthropology.

MAN AND HIS STRUCTURAL AFFINITIES.—Abstract of a Lecture delivered before the Buffalo Society of Natural Sciences. By A. R. Grote. A valuable and interesting paper, with 28 figures. Remarkable similarity of the Bony Structure of various animals. The Gorilla, with Portrait. The Gorilla compared with Man. The Chimpanzee, the Orang-outang, and several Apes and Monkeys. Our Relation to the Anthropoid Apes. Comparative Brain Development. SUPPLEMENT **148.** Price 10 cents.

WAYS OF REMEMBERING.—BY J. MORtimer Granville, M.D. The author, contending that all so-called "Technical Memories" in vogue are unscientific, points out the fact that the only true basis of memory is a well-informed impression; and, showing that mental impressions travel more freely along some lines of communication than others, with the external, he explains how any one, by bestowing a few hours to an experiment that he suggests, may obtain an insight into his individual way of remembering, and having gained this knowledge he may be able to determine which of his powers it is best to cultivate by the methods here proposed. This paper is of the highest practical importance to every student or reader who desires not only to *know* things but to acquire the rare faculty of *retaining* them perfectly in the memory. Contained in SUPPLEMENT **203.** Price 10 cents.

THE ANTIQUITY OF MAN.—BY THE Rev. L. J. Templin. A paper read before the Popular Science Club of Hutchinson, Kansas, wherein the author gives an impartial review of the evidences that we possess as to prehistoric existence of man in Europe and America, and draws the conclusion that the existence of man on the earth probably extended farther back into the past than the limit assigned in the most popular chronology of the present day; but that the claim for a human race whose existence reaches back through many decades of centuries seems based on erroneous interpretation of facts. A short but valuable and exceedingly interesting essay by one of America's foremost archæologists. Contained in SUPPLEMENT **183.** Price 10 cents.

INFLUENCE OF AGE UPON THE INtellect.—A very interesting paper, giving an enumeration of some of the greatest writers and thinkers that the world has produced, and the ages at which they wrote some of their most celebrated works; the examples given proving conclusively that the human mind seldom decays before the approach of death. Contained in SUPPLEMENT **246.** Price 10 cents.

THE PHENOMENA OF HUMAN LIFE.—An address by Professor John Tyndall. A most able and interesting paper, in which the Laws of Energy and the Continuity of Motion as they are found in the material universe are pointed out and their existence traced in the Animal Economy and the Human System. The operation of the Will and the Relations between the Mind and Body are described in the clearest manner from the standpoint of the man of science. SUPPLEMENT **97.** Price 10 cents.

Medicine, Hygiene, Surgery, Etc.

HYGIENE IN THE HIGHER EDUCAtion of Women.—By A. Hughes Bennett, M.D. A paper designed to show why women deteriorate in health when subjected to bodily and mental strain, in distinction from men, in whom, under the same circumstances, it is unusual. The physical conformation of woman. Her nervous conformation. Her intellectual conformation. Her disposition. The effects of social life and education on woman. Conclusions of the author, that the welfare of woman should be consulted, not by encouraging her to take an independent position in life, but by educating her in such a judicious and sensible manner as will make her a good wife, mother, and useful member of society. Contained in SUPPLEMENT **215.** Price 10 cents.

YELLOW FEVER.—A HIGHLY INstructive lecture recently delivered by Prof. Alfred Stillé, M.D., LL.D., before the Graduating Class of the Medical Department of the University of Pennsylvania. The earliest accounts that we have of Yellow Fever. Its Origin. The Seeds of Trans-Atlantic Epidemics Imported from America. The Disease has never originated outside of the West Indies. The Conditions which generate Yellow Fever. The Disease proved to be of limited Local Origin. The Efficacy of rigid Quarantine. Circumstances which influence the Diffusion and Fatality of the Disease. The Comparative Immunity of the Colored Race. The Essential Cause of Yellow Fever. The Germ-Origin not Proven. Death not caused by Uræmia. The Contagiousness of the Fever. The Disease transported by *Things* and not by Persons apart from their Clothing. Its Non-Contagiousness; the Disease not Transmitted from one Person to another, but generated in the System. The Disease an Infectious One. The Rapidity with which the Yellow Fever Poison is Diffused. Progress of the Fever arrested by a Low Temperature. The Pathology of the Disease. An Explanation of the Black Vomit. The Liver and Kidneys in Yellow Fever. Summary of the Ground thus far gone over. The Forms of Yellow Fever. The Symptoms of Inflammatory Yellow Fever. The Malignant Type of the Disease. The Prognosis of the Disease. Diagnosis of Yellow Fever. Treatment. No Specific for the Disease. SUPPLEMENT, No. **190.** The same number contains a valuable paper on "Chronic Articular Rheumatism and Rheumatoid Arthritis," their Symptoms and Treatment. Price, 10 cents

CLIMATE CURE IN NERVOUS DISeases.—By Wm. F. Hutchinson, M.D., U. S. N. A valuable paper urging the efficacy of "climate cure" for cases of diseases of the nervous system, or those which are the result of lack of nutrition. The value of sea voyages in certain cases. Railroads to be avoided. The advantages of Newport as a summer residence for invalids. The value of long sea voyages with pleasant companions. European resorts not recommended. Old Point Comfort. The Bermudas, the Bahamas, and the Windward Islands as winter residences for invalids. Sandwich Islands as sanitaria for nervous invalids. Contained in SUPPLEMENT **213.** Price 10 cents.

A COMBAT WITH AN INFECTIVE ATmosphere.—A Lecture delivered at the Royal Institution, by John Tyndall. A series of important Experiments described. How the Putrefactive Power of Air may be removed. Organic Infusions kept clear for months in contact with air. Facts tending to Disprove Spontaneous Generation. This Remarkable Lecture, with essays on the Formation of Raindrops and Hail, the Chemical Harmony of the Universe, and like entertaining subjects. SUPPLEMENT **65.** Price 10 cents.

CLUB-FOOT; SPINAL CURVATURE; Hip-joint Disease.—Lecture by Prof. L. A. Sayre at Bellevue Hospital, N. Y. Club-foot Treated by a New, Painless Method. Several Cases described, and Success in Treatment. Useful Suggestions for Adhesive Plaster. How to Detect Incipient Hip-joint Disease. How to Distinguish between Hip-joint Disease and Psoitis. Treatment. Also, Corrosive Sublimate in Dentistry, Mental Illusions, the Color of the Retina, Insanity in the United States, Treatment of Paralysis of the Eye Muscles, Antiseptic Dressings, Near-sightedness. SUPPLEMENT **122.** Price 10 cents.

BURNS.—A CLINICAL LECTURE BY R. J. Levis, M.D. No class of injuries so often fatal as these. The varied character of Burns and their classification. The effects following applications of heat during different periods. Scald and its results. Effect of exposure to the sun's rays not to be classed with burns. The two urgent demands to which attention should be directed when the patient is brought in. Treatment of the pain and of the shock. How the clothes should be removed and the blisters treated. Subsequent local treatment of the burned surface. The Remedies to be employed. Treatment of extensive burns; how the dressings should be prepared. Carbolized oil, carbonate of soda, linseed oil and lime-water, carbonate of lead and oil. How mortification is to be treated. How visceral complicationsare to be guarded against. Structural changes that are to be aided by plastic surgery. SUPPLEMENT, No. **176.** The same number contains an interesting article on the "*Rashes that are Produced by Drugs in Daily Use.*" Price, 10 cents.

HYGIENE OF THE HAIR.—BY PROF. Erasmus Wilson. Cleanliness of the Hair, and how to secure it. Cures for Baldness. Gray Hair, and its Cure. Dyeing condemned. SUPPLEMENT **102.** Price 10 cents.

PREVENTION OF DIPHTHERIA.—BY Dr. Edwin R. Maxson. An examination of the history, causes, and pathology of this widely prevalent affection; offers a number of thoughtful suggestions as to how it may be prevented and finally exterminated. This is a paper of great interest and value to physicians and parents. Contained in SUPPLEMENT **281.** Price 10 cents.

EXTIRPATION OF THE LARYNX.—BY David Foulis, M.D. Replacing the Larynx by a Voice-tube. Wonderfully Natural Voice Regained. Particulars of the Apparatus, and Three Figures. Also, Treatment for Distended Bladder at the University College Hospital, London; Medical Notes in Siam, China, and Japan. SUPPLEMENT **115.** Price 10 cents.

DEAFNESS—THE ORGAN OF HEARing in Health and Disease.—By W. S. Bowen, M.D. An essay on Curable and Preventable Deafness, describing the different components of the Organ of Hearing in Health, and entering into a consideration of those Diseases and conditions attended by loss of Hearing that are readily amenable to successful treatment if attended to. A plain, practical paper, devoid of technicalities, and readily understood by the general reader. SUPPLEMENT, No. **166.** The same number contains an interesting paper on "Wax in the Ears," by William A. Hammond, M.D.

LOSS OF HAIR.—BY JNO. V. SHOEMAKER, M.D. An excellent paper on a subject which is of interest and importance to every one. It points out the peculiarities and characteristics of the hair as found in a state of health in men, women, and children, and its variations according to climate and nationality, how and why it becomes thin and gray, or falls out, and the means that should be taken to prevent it; the proper attention that it deserves, the remedies that should be used in various diseased conditions; the cause of dandruff and its remedy, and advice as to the best lotions and washes to keep the hair and scalp in a healthy state. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **173.** Price 10 cents.

ERRORS IN DIET.—BY DR. WILSON F.R.S. The Sufferings from Wrong Diet. How Nutrition and Economy can be combined. Proper Diets for the Working Man, for Infants, and for Children. Best hours for Meals. Drinking Tea and other Stimulants. SUPPLEMENT **94.** Price 10 cents.

ALCOHOLISM. — AN INTERESTING Paper upon the Relations of Intemperance and Life Insurance. The average Risks and Expectancy of Life of the Temperate and of the Intemperate. Physiological action of Alcohol; stimulating the Nervous System, Retarding the Circulation. Alcohol Oxidized in the System. Insomnia, Congestion of the Lungs, Deterioration of Structure, Calculus, and Liver Diseases as results of Liquor. Extended Medical Testimony. SUPPLEMENT **125.** Price 10 cents.

CATARRH.—BY DUDLEY S. REYnolds, M.D. Character of the Disease. The Epizootic as Catarrh. Acute, Chronic and Dry Catarrh. Treatment, Appliances, etc. Additional subjects, as Milk Diet, Treatment of Rheumatism, Removing Foreign Bodies from the Eye. Is Consumption Inoculative. etc. SUPPLEMENT **84.** Price 10 cents.

PROFESSOR HUXLEY'S RECENT INteresting address before the International Medical Congress, London, on the Connection of the Biological Sciences with Medicine, is published in SUPPLEMENT **300.** Price 10 cents.

ON CHRONIC MALARIAL POISONING.—By Aifred L. Loomis, M.D. A Highly Instructive Clinical Lecture, delivered at the University Medical College, N. Y. According to Professor Loomis, the effects of malarial poison are manifested in a surprising variety of forms and symptoms; so numerous and various, in fact, that they cannot be tabulated. They embrace enlargement of the spleen, neuralgias of different forms, that may or may not be periodical; dyspeptic troubles which cannot be relieved by dyspeptic remedies; headaches that are often treated as cerebral diseases; confusions of mind; staggering gaits; loss of power in portions of the body; impairment of mental faculties; inability to do work of any kind: not sick enough to go to bed, but too ill and habitually too tired to perform anything that requires the least exertion; shortness of breath; rapid, weak, irregular pulse; sleepless nights, etc. The infection appears to be far more widely spread than is commonly supposed; and all who have ailments that fall within the category here mentioned will do well to read this excellent lecture. SUPPLEMENT **102.** Price 10 cents.

MEDICAL PRESCRIPTIONS AND FORmulæ.—The following New Remedies, viz.: Cosmoline Cream, Mistura Antispasmodica, Elixir of Monobromated Camphor, Effervescing Carbonate of Iron, Emollient Glycerine Lotion, Podophyllin Pills. The following Standard Formulæ, determined by the Societe de Pharmacie of Paris for certain new preparations, with full directions for preparing Salicylic Acid, Thymic Acid, Crystallized Aconitine, Ammonium Bromide, Apomorphia, Theine or Caffeine, Bibasic, Calcium Phosphate, Sirup of Calcium Chlorhydrophosphate, Sirup of Calcium Lactophosphate, Sirup of Acid Calcium Phosphate, Glycerole of Calcium Saccharate, Liniment of Calcium Saccharates and other valuable items. Formulæ, etc., as the following: Solution of Bromide of Arsenic, Analysis of Ride's Food, Ammoniated Tincture of Guaiacum in Inflamed Throats, Gargle for Sore Throat, How to cure a bad cold, Digestive Pastilles of Borivent, "Sulphur Pills," etc. SUPPLEMENT **75.** Price 10 cents.

WRITER'S CRAMP AND ALLIED AFfections.—By George M. Beard, M.D. Contained in SUPPLEMENT **177.** Price 10 cents.

HEADACHES AND THEIR TREATment.—By Dr. F. A. Simmons. An interesting and valuable paper, showing the various causes, immediate and remote, that give origin to headaches. The study of conditions of system shown to have a practical bearing on treatment. Proper mode of treating the various forms of headache. Contained in SUPPLEMENT **258.** Price 10 cents.

TREATMENT OF CANCER WITH Caustics.—By Edgar Ettinge, M.D. An account of the author's successful treatment of cancerous growth by the local application of the juice of wood-sorrel. Contained in SUPPLEMENT **272.** Price 10 cents. The same number contains an article by Dr. F. H. Stuart on the "Advantages of Caustics for the Removal of Malignant Growths."

MEDICAL USES OF CARBOLIC ACID. Clinical Lecture delivered at the Norfolk and Norwich Hospital, Eng., by Peter Eade, M.D. Properties of the Acid, and its Medical Preparation and Action. Bacteria, and How Destroyed. Boils, Carbuncles, Festers, Ringworms, etc., cured by Carbolic Acid. The Healing of Strumous Sores assisted by Carbolic Acid. Carbolic Acid in Excoriation or Ulceration of the Neck of the Uterus, in cases of Phthisis, and in some Stomach Disorders. Two cases of Successful Treatment of Carbuncle by Carbolic Acid. SUPPLEMENT **138.** Price 10 cents. Also, in same number, the Alkaline Treatment of Burns and Scalds; Danger from Hypodermic Injection of Morphia; Strumous Disease Treated by Volcanic Vapors, etc.

ON THE CURE OF CONSUMPTION.—By James H. Salisbury, M.D. The author, who has been treating consumption successfully for the last twenty years, states that if the directions given in this paper are faithfully followed out and persisted in, Consumption in all its stages becomes a curable disease. His method, which is herein given complete, embraces the drinks and food that are to be used, the clothing that should be worn, the baths and exercise to be taken, directions as to meals, and the treatment, which includes prescriptions for the medicine to be employed, and directions for taking. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **198.** Price 10 cents.

OPEN AIR FOR CONSUMPTIVES.—BY H. B. White. Importance of Open Air for Disease. Lessons of the Late War. Cold Air not injurious to Diseased Lungs. Consumption simply the result of Foul Air. Florida, and other Health Resorts. The Hawaiian Islands. Description of the Climate and its Wonderfully Salutary Effect, with cases of Consumption Arrested there. SUPPLEMENT **107.** Price 10 cents.

RELATIONS OF DYSPEPSIA WITH Constitutional Diseases.—By Dr. J. Cornillon. Remarkable Sympathy between the Stomach and other Organs. The Etiological Value of Dyspepsia in Diathetic Diseases. Gastric Troubles a Determining Cause of Pulmonary Phthisis, with two Cases. Opinions of Beau, MM. Herard and Cornil, Andral, M. Bouchardat, and others. Carcinoma of the Stomach. Dyspepsia in Arthritic Disorders. Dyspepsia one of the first Visceral Manifestations of the Ureic Diathesis, with Clinical Facts. Dyspepsia and Gout Alternate. Dyspepsia the Effect of Rheumatism. General Characteristics of Dyspepsias dependent on Diathesis and on certain Chronic Diseases. A Dyspepsia being given, can we Diagnosticate the Diathesis or the Chronic Disease on which it Depends? Abnormal Appetite of Diabetic Patients. Dyspepsia producing Nervous Disorders. How to Distinguish between Idiopathic and Symptomatic Dyspepsia. Alcoholic Dyspepsia. Contained in SUPPLEMENT **133.** With A NEW FORM OF FIELD TOURNIQUET: PLASTER OF PARIS SPLINTS. Abstract of a Clinical Lecture, by John Croft, F.R.S., with How to Make and Use the Splints, and Useful Remarks on Fixed Bandages. Also, an article on the Progress of Nerve Surgery, and a Biographical Sketch and Portrait of William Harvey. Price 10 cents.

SYSTEMATIC EXERCISES. — THEIR Value in the Prevention of Disease.—By Edward T. Tibbits, M.D. A highly important and valuable paper. Read before the Leeds and West Riding Medico-Chirurgical Society. How much Exercise every one ought to Take. Much Disease a Result of Over-gratification of the Appetites. Cultivation of the Will a Cure for Bodily and Mental Ills. Criminal Negligence of Mothers. The Moral Influence of Bodily Exercises, and How they Aid in Controlling the Appetites and Passions. Contained in SUPPLEMENTS **150, 152.** Price 10 cents each.

THE MEDICINAL USE OF ALCOHOL and its Dangers.—By J. D. Crothers, M.D. Being Clinical Studies of the Histories and Early Causes of many Cases of Inebriety. With Medical Testimony and Remarks on several Remedies having Alcohol as a Base. Contained in SUPPLEMENT **143.** Price 10 cents.

STATE INSANE ASYLUM OF NEW JERsey.—With Two Illustrations and Ground Plan. Detailed Description of one of the Best Constructed Public Institutions in the country, with particulars of the Best Apparatus and Methods in use for the Culinary Department, Ventilation and Warming, Lighting, and Laundry work. Also, Practical Experience in the Causes of Insanity, and Treatment. SUPPLEMENT **110.** Price 10 cents.

HOT WATER TREATMENT.—SERVICE of Dr. Frank H. Hamilton, Bellevue Hospital. Amputation Obviated. Recovery from Gangrenous Slough, etc. SUPPLEMENT **117.** Price 10 cents. Also, in same number, valuable Medical Notes on Bloodless Tracheotomy, Cholera, Internal Fat, Diabetes, Death of M. Claude Bernard, Blue Bile, the London Smallpox Epidemic, Fatal Laundry, Disinfecting in Dublin.

THE GLANDULAR ORIGIN OF CONtagious Diseases.—Address by B. W. Richardson, M.D., President of the Sanitary Congress, England, presents the Latest Researches and Facts concerning the Origin of Diseases, such as Small-pox, Measles, Scarlet fever, Diphtheria, Typhus fever, Typhoid fever, Erysipelas, Hospital fever, Puerperal fever (or the fever which occurs to women in child-bed), Cholera, Yellow fever, Ague, Glanders, Boil and Carbuncle, Infectious Ophthalmia, showing that these diseases are caused by organic poisons, how they are spread, and how they may certainly be prevented. This is one of the most valuable, important, clear, and interesting papers ever produced on this subject. SUPPLEMENTS **99** and **100.** Price 10 cents each.

HISTORY AND PARTICULARS OF DR. Tanner's Recent 40-day Fast.—By P. H. Vander Weyde, M.D. Dr. Vander Weyde was one of the scientific experts and watchers who attended throughout the fast, and made the chemical and microscopical examinations of the excretions and blood of the patient. The resent interesting and valuable paper contains an account of the origin of the trial, and the condition and changes noted in the patient from day to day. The paper is accompanied with a table of Physiological Observations showing the alteration in Dr. Tanner's weight, at successive periods during the fast, his pulse, temperature, respiration, quantity of water taken and voided, quantities of urea and phosphates, engraving of the remarkable changes in the form of the patient's blood corpuscles, as seen in the microscope, with many other valuable particulars. Contained in SUPPLEMENT **244.** Price 10 cents.

OLEATE OF MERCURY FOR THE HAIR.—By A. H. DeYoung, M.D. A brief statement of the advantages to be derived from the use of Oleate of Mercury in diseases of the scalp and skin; and the importance of this remedy as an addition to our Materia Medica. Contained in SUPPLEMENT **285.** Price 10 cents.

FORCED ALIMENTATION.—BY ALEXander Hutchins, M.D. A very suggestive paper, in which the author takes issue with the popular opinion that food should not be taken when the desire for it does not exist, since certain clinical facts prove the contrary, and point to forced alimentation as an important therapeutic agent. Impaired nutrition shown to be associated with a wide range of chronic diseases. The advantages of well directed feeding pointed out. Drug-taking no substitute for alimentation. Choice of foods in forced alimentation. The classes of patients who especially need these therapeutic measures. Contained in SUPPLEMENT **222.** Price 10 cents.

TEMPORARY DEAFNESS.—BY H. A. Wilson, M.D. A valuable clinical lecture, dealing more especially with that form of the complaint which is due to impacted cerumen. The various causes that conspire to produce an excess of wax in the ears, and how it is to be prevented or treated. Contained in SUPPLEMENT **264.** Price 10 cents.

BALDNESS.—BY GEORGE H. ROHE, M.D. A brief but Highly Useful paper, showing the causes of Baldness, how Dandruff is produced, why the Hair falls off, with explanations of Kafosi's Prompt and Effectual Remedy and Recipe for the same; together with Directions and General Advice for Preventing Baldness, Restoring and Preserving the Hair. This is one of the most Useful, Practical, and Valuable Papers concerning the Treatment of Baldness ever published. Contained in SUPPLEMENT **161.** Price 10 cents.

ON VIRULENT DISEASES, AND ESpecially on the Disease commonly called Chicken Cholera.—By M. Pasteur. An important paper in which are presented by the author certain new facts which throw an unexpected light on the problems raised by the study of virulent diseases; these facts having been ascertained by a recent careful investigation of the fearful poultry disease known as "Chicken Cholera," and the results of which investigation are herein given in detail. Contained in SUPPLEMENT **242.** Price 10 cents.

TREATMENT OF ORGANIC HEART Disease. By William Pepper, M.D. A Clinical Lecture devoted to the consideration of the following topics: (1). Treatment of the Functional Embarrassment, embracing all the various kinds of local Congestions and Effusions; (2) Treatment of the Cardiac Distress; (3) The proper management of the Heart Lesion itself. SUPPLEMENT, No. **172.** Price 10 cents.

HOW THE AIR PASSAGES ARE EXplored. By F. Seeger, M.D. Diagnosis of Disease of the Larynx, with Description and two figures of the Laryngoscope and the Rhinoscope, and Directions How to Use. The Wonders of the Vocal Organ and the Voice. SUPPLEMENT **108** Price 10 cents. Also, in same number, Physiological Notes; Near-sightedness, etc.

OBESITY: A FEW THOUGHTS ON ITS Nature and Treatment.—By J. J. Mulheron, M.D. Obesity shown to be an abnormal condition, the result of a transgression of fixed physiological laws, and differing in this respect in nowise from diseases in general; the dangers attendant upon it; method of treatment, embracing diet exercise, and medication. Contained in SUPPLEMENT **210.** Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Medicine, Hygiene, Surgery, Etc.

NASAL CATARRH.—BY DR. F. H. Bosworth. A paper read before the New York Academy of Medicine: to which is appended the discussion of the subject which took place subsequently among the members, and in the course of which much light was thrown on the following mooted questions: What is Nasal Catarrh? What are its tendencies? How can it best be treated? Can it be cured? Contained in SUPPLEMENT **262**. Price 10 cents.

RAPID BREATHING AS A PAIN OBtunder in Surgery, Obstetrics, and the General Practice of Medicine and Dentistry.—By Dr. W. G. A. Bonwill. Contained in SUPPLEMENT **275**. Price 10 cents.

RHEUMATISM.—BY M. P. GREENsword, M.D. Experience of the author in the successful treatment of rheumatism in the West Indies, where the disease occurs under complicated forms. Mode of treatment, external and internal. Prescriptions. Contained in SUPPLEMENT **291**. Price 10 cents.

ROTARY-LATERAL SPINAL CURVAture.—By Prof. Lewis A. Sayre. Lecture delivered at the Bellevue Hospital, N.Y. Pott's Disease. Dr. Banning's Method. Broadhurst's Apparatus, and others. Judson's Method. Philosophy of Spinal Curvature. Self-extension and its beneficial results as illustrated by several cases. SUPPLEMENT **111**. Price 10 cents.

MORBID FEAR AS A SYMPTOM OF Nervous Disease.—By George M. Beard, M.D. Morbid fears the result of functional diseases of the nerves; the increase in the forms of morbid fears in modern times; morbid fears symptoms of disease rather than disease themselves; the varieties of morbid fear associated with brain exhaustion; astraphobia, or fear of lightning; agoraphobia, or fear of places; topophobia, the fear of open spaces; anthropophobia, or fear of man; gynephobia, or fear of woman; monophobia, or fear of being alone; pathophobia, or fear of disease; pantophobia, or fear of everything; phobophobia, or fear of fears; mysophobia, or fear of contamination. The symptoms which accompany these various forms of fear, and how they should be treated. Contained in SUPPLEMENT **194**. Price 10 cents.

PNEUMONIA.—BY ALONZO CLARK, M.D. Two valuable and interesting clinical lectures, by one of our most eminent physicians, embodying much information not to be found in the text books. Pneumonia defined; where and how the disease begins in the lung, and the direction in which it spreads; the changes that take place in the lung during the progress of the disease; the three stages of the disease and their symptoms; the first physical signs of pneumonia; the distinction between the rale of pneumonia and that of bronchitis; different ways in which persons are affected at different times of life; the causes of pneumonia; diagnosis of the various forms of the disease; and proper method of treatment. Contained in SUPPLEMENTS **219** and **220**. Price 10 cents each.

PHTHISIS.—BY EDWARD C. JANEway, M.D. A clinical lecture delivered at Bellevue Hospital, showing that phthisis may be developed in a person in whom there is no hereditary tendency to the disease; that tobacco factories, and many other factories, are the places where phthisis often originates; and that it is better to take steps to prevent the development of the disease than to await until after its development and then try to effect a cure. Contained in SUPPLEMENT **246**. Price 10 cents. The same number contains papers on *Callender's Method of Treating Abscess*, *Rapid Breathing as a Pain Obtunder*, and several other medical subjects.

SCARLET FEVER. — A VALUABLE clinical lecture by Prof. Alonzo Clark, M.D., College of Physicians and Surgeons, New York. Preliminary remarks on prevalence of the disease, and statistics of mortality. The several periods of scarlet fever. Period of incubation. Period of invasion. The eruptive stage. How the eruption spreads. Division of the disease into scarlatina simplex, scarlatina anginosa, and scarlatina maligna. Affections of the throat accompanying the disease. Sequelæ of the fever. Best known modes of treatment. Contained in SUPPLEMENT **239**. Price 10 cents. The same number contains a valuable article on the *Treatment of Whooping Cough with Atropia used Hypodermically and Carbolic Acid Inhalations.*

SKIN DISEASES, AND SOME IMPORTant Topical Remedies used in their Treatment.—By John V. Shoemaker, M.D. An important contribution to medical literature, pointing out the proper use of soaps in treating skin diseases, and what kinds and how they should be used; treating of numerous practical facts in regard to certain new preparations embraced under the name of "oleates," and urging the great importance of mechanical remedies, such as friction, compression, etc., in the external treatment of skin diseases, and showing how and when they should be applied. Contained in SUPPLEMENT **210**. Price 10 cents.

THE TURKISH BATH: WHAT IT IS, and what it does.—By John Stainback Wilson, M.D. A valuable article pointing out the great value of this perfection of baths as a therapeutic agent, and its wide range of applications. Processes of the Turkish Bath. The Physiological and Therapeutic action of the Turkish Bath. An enumeration of the various Diseases in which the Bath will be found useful. Contained in SUPPLEMENT **226**. Price 10 cents.

ON THE HYGIENIC AND THERAPEUtic Influences of Habits and Character in the Medical Profession.—By Edwd. T. Tibbitts, M.D. In this paper the author points out to the profession the immense power they possess of working either harm or good to their patients through their own personal habits or their influence; and with a knowledge of how powerful this influence is he counsels that they should endeavor to lead as nearly as possible model lives—lives which will not only *bear* but *court* imitation. Contained in SUPPLEMENT **211**. Price 10 cents.

THERAPEUTICAL USE OF THE MAGnet.—By William A. Hammond, M.D. A consideration of the therapeutical uses and value of the magnet in cases of chorea and paralysis, based on the author's recent experience, with accounts of recent cases of disease treated by the application of the magnet, prefaced by an interesting sketch of the history of the employment of the magnet in medicine. Contained in SUPPLEMENT **258**. Price 10 cents. The same numbers contains a notice of the use of the "Magnet in Paral 'iy, by Prof. Nothnagel.

ASPERGILLUS IN THE LIVING HUman Ear.—By Chas. H. Burnett, M.D. Illustrated with three engravings. Contained in SUPPLEMENT **208**. Price 10 cents.

THE EAR.—BY CHAS. H. BURNETT, M.D. A valuable paper, giving a report of four cases, among many others, in which is shown the beneficial effect derived from the prolonged and uninterrupted wearing of cotton pellets as artificial drum-heads, and which the author claims are the only useful kind of artificial drum-heads that have ever yet been devised. Contained in SUPPLEMENT **217**. Price 10 cents.

TREATMENT OF TYPHOID FEVER.—By Alfred L. Loomis, M.D. How to Reduce the Temperature. How to sustain the Vital Power. How to maintain Nutrition, and Practical Directions on Diet. This important lecture, with numerous additional Medical Essays on Lymph; Hydrophobia cured by Oxygen; Chloral Hydrate in scalds and burns; Brown-Sequard on Nerve Disease; Therapeutic Uses of Zinc Cyanide, etc. SUPPLEMENT **60**. Price 10 cents.

RAPID BREATHING AS A PAIN OBtunder.—A brief statement of the facts in regard to Dr. Bonwill's discovery that, by causing his patients to breathe rapidly for a few minutes, the sense of pain was so obtunded that he could extract teeth without causing pain. Method of producing the analgesia in patients. Dr. Bonwill's theories as to the causes of the phenomenon. Contained in SUPPLEMENT **246**. Price 10 cents. The same number contains valuable articles on *Phthisis* and other medical subjects.

THE BREATH, LIPS, TEETH, AND Mouth, and the Physical Signs derivable therefrom.—By G. V. Poore, M.D. A critical study of the various physical signs of disease which are to be obtained from an examination of the throat and windpipe, and also of the oral and nasal cavities which lie above them. The smell of the breath as a valuable physical sign. The inspection of the lips. Dribbling of saliva. Inspection of the gums. The condition of the teeth as evidences of constitutional conditions. The state of the mucous membrane of the mouth. Contained in SUPPLEMENT **242**. Price 10 cents.

THE INSANE AT GHEEL.—ABSTRACT of a paper by Dr. W. J. Morton, on the Town of Gheel, Belgium, and its Insane, treating of: The Administration of the affairs of the Insane. The Nourriciers and Hosts. The Medical Service. The Infirmary. The Insane in their Homes. The Hamlets. The "Gheel Idea." Contained in SUPPLEMENT **271**. Price 10 cents.

LONGEVITY, OR THE NATURAL DUration of Life.—An able and interesting paper by Dr. B. W. Richardson, pointing out the fact that man by his organization was designed by his Creator to live, endowed with the sensibilities of life and intelligence, for a period of a hundred years; and showing by means of a description of an ideal people, how civilized man should live in order that this, his natural term of days, may be reached. Contained in SUPPLEMENT **211**. Price 10 cents.

SALICYLIC ACID FOR THE CURE AND Prevention of Diseases in Cattle and Live Stock. A condensed account of some of the principal results that have been obtained in Germany by an appropriate application of salicylic acid to the cure of cattle diseases. Treatment of Erysipelas, Angina, Variola, Rheumatism, and Lameness in Swine. Diarrhea in Cows and Calves, Milk Fever in Sows. Diseases of Poultry, Glanders, Pleuropneumonia, and Diseases of the Blood in the Horse. Prevention of "Foul-brood," etc., among Bees. Contained in SUPPLEMENT **244**. Price 10 cents.

WHAT TO DO WHEN AT A LOSS.—Some brief rules to be adopted by the physician in cases where a malady has not developed itself sufficiently to form a correct diagnosis of it, but where something must be done at once that shall be beneficial to the patient. Rest. Salines. Relief of organs functionally disturbed. No opinion to be hastily expressed. Contained in SUPPLEMENT **266**. Price 10 cents.

ON DIPTERA AS SPREADERS OF DISease.— A suggestive paper by Mr. J. W. Slater, showing the probability that every infectious disease may be, and actually is, at times, propagated by flies, and proposing a method by which the danger may be obviated. Contained in SUPPLEMENT **303**. Price 10 cents.

THE CONTAGION OF CONSUMPTION.—By James T. Whittaker, M.D. An interesting discussion of the specificity of the tuberculous virus. The views of the older writers. The insight obtained into the nature of tuberculosis in modern times through scientific experimentation. The close amalogies between tuberculosis and syphilis. The symptoms of each. No such thing as predisposition to either disease. Both may be inherited, yet in majority of cases are acquired. Various ways in which tuberculosis may be acquired by those in whom it is not hereditary. The future outlook for the therapy of the disease. Contained in SUPPLEMENT **243**. Price 10 cents.

VACCINATION OF ANIMALS.—BY Prof. Pasteur. An address before the International Medical Congress, bringing to notice a new advance in the study of *Microbie* as applied to the prevention of transmissible diseases in animals. Contained in SUPPLEMENT **300**. Price 10 cents.

THE PULSE.—BY T. A. McBRIDE, M.D. A valuable clinical lecture, delivered at the New York College of Physicians and Surgeons. The different kinds of pulse defined. Directions for examining the pulse. The factors of the pulse, and the several phenomena dependent upon them. Table of variations in frequency of the pulse in health. Influences of sex, posture, sleep, food, emotions, etc., on the pulse. Phenomena attending the pulse in disease. Diagnosis and prognosis of the pulse in fevers, inflammations, nervous exhaustion, etc. A paper of great interest to students. Contained in SUPPLEMENT **235**. Price 10 cents.

CHICKEN CHOLERA. -- A RECENT communication by M. Pasteur, to the French Academy, giving the results of his experiments with the parasite which produces chicken cholera; showing that there is an attenuated virus of this disease, and that one or more inoculations of this attenuated form may preserve chickens from death, when inoculated with the virus of maximum virulence. Contained in SUPPLEMENT **271**. Price 10 cents. Another paper by the same author "On the Attenuation of the Virus of Chicken Cholera," also read before the French Academy, is given in SUPPLEMENT **283**. Another article on this subject, by the same author, pointing out the "conditions of non-recidivation and of some other characteristics of chicken cholera," may be found in SUPPLEMENT **274**. Price 10 cents each.

ASPHYXIA.—A SPEEDY METHOD.—By Harvey L. Byrd, M.D. The method herein given, it is believed, will be found a highly valuable, if not the most important, addition to our list of appliances in the asphyxia of children, and also for the relief of that condition in the adult, when properly manipulated. The procedure is easy of accomplishment, and requires no preliminary arrangement or preparation for its application, but may be put into execution the moment the condition of the patient may demand it. Illustrated with three figures. Contained in SUPPLEMENT **215**. Price 10 cents.

SMALLPOX.—A PAPER BY DR. OSCAR C. DeWolf, giving the methods employed very successfully during the last four years to prevent the spread of smallpox in the city of Chicago. Contained in SUPPLEMENT **287**. Price 10 cents.

TYPHOID FEVER.—A CLINICAL LECture, by Prof. Austin Flint, M.D., giving the various symptoms by which the disease may be recognized and distinguished from other fevers, and pointing out the proper methods of treating it. Contained in SUPPLEMENT **251**. Price 10 cents. The same number contains an article on a "New Treatment for Typhoid Fever."

ASTHENOPIC SYMPTOMS IN EMMEtropic and Ametropic Eyes, points in the management of.—By O. D. Pomeroy, M.D. LECTURE I.—The emmetropic eye. Treatment of asthenopic symptoms without spectacles. The use of atropine. General hygienic management of asthenopia in the emmetropic eye. Dyer's plan. Indications for the use of glasses in presbyopia. The use of glasses in an aphakial eye. LECTURE II. — Hypermetropia. Convergent squint and hypermetropia. Glasses after tenotomy for convergent squint. Atropine in convergent squint. The vision of hypermetropes. Astigmatism in hypermetropia. Myopia. What glasses should be given to a myope. Contained in SUPPLEMENT **255**. Price 10 cents.

CLOTHING IN ITS RELATION TO Health.—Being the investigations of Prof. Jaeger regarding the relation which the proper selection of clothing bears to the health of the individual. His discovery that a diminution of water contained in the body is of vital importance. The discovery corroborated by experimentation. Different methods tried by him to diminish the quantity of water in the body. The only permanent result was that obtained by a proper selection of material and form of clothing; particularly the employment of animal wool for clothing, to preserve health, to prevent the accumulation of fat and water in the system, and to ward off disease. Contained in SUPPLEMENTS **253** and **256**. Price 10 cents each. No. **256** also contains a valuable article explanatory of Dr. Jaeger's new theory of "Neural Analysis."

SUSPENDED ANIMATION. — BY DR. Benjamin W. Richardson, F.R.S. A valuable article, wherein are given the views of this celebrated writer as to the possibility of suspending animal life for indefinite periods. Embracing all that is known on this subject up to the present time by experiment. Describing the action of certain chemical and physical agencies on the body to produce a state simulating death. The three states of muscular irritability. The one circumstance on which depends the time during which an animal body may be reanimated. The possibility of temporarily producing a state of suspended animation shown by research and experiment. The action of cold on cold-blooded and hibernating animals. Restoration to life of chloroformed animals. The various agents which are known to suspend, without necessarily destroying, life. Mandragora, its properties. Nitrite of Amyl. Woorali. Chloral Hydrate. The Cyanogens. Alcohol. Oxygen. A very instructive essay, and a valuable contribution to science, by the most eminent living authority on the subject. Contained in SUPPLEMENT **185**. Price 10 cents.

IS TYPHOID FEVER CONTAGIOUS?—By T. J. Maclagan, M.D. An important contribution to the literature of zymotic diseases. Contained in SUPPLEMENT **207**. Price 10 cents. The same number contains an article on the *Treatment of Diabetes Mellitus*, by Dr. Salisbury.

THE HAY FEVER PHILOSOPHERS.—A report of facts prepared by a committee and which are to be presented before the U. S. Hay Fever Association at its next meeting. Brief history of Hay Fever, showing it to be a modern disease. All classes subject to it. Hereditary nature. Geographical distribution. Cities of refuge. Limits of the exempt regions. Residence in any particular locality as a preventive of autumnal catarrh, after all a very uncertain matter. Contained in SUPPLEMENT **242**. Price 10 cents.

TREATMENT OF THE DROWNED.—A series of valuable directions, indorsed by the Boards of Health of several cities and States, showing how to proceed to restore to consciousness, not only persons that have been drowned, but also those that have been suffocated by the inhalation of smoke or any poisonous gases, and those in whom the action of breathing has been temporarily suspended through hanging, or through the effects of chloroform, hydrate of chloral, etc. With three engravings. Contained in SUPPLEMENT **201** Price 10 cents.

CONSTIPATION AND ITS EFFECTS.—By E. S. F. Arnold, M.D. An important contribution to the literature of a subject little treated of in medical works. Depression and debility attending constipation. Other symptoms attending the trouble. Constipation as a source of disease. Some remarkable cases and cures. Contained in SUPPLEMENT **284**. Price 10 cents.

ETIOLOGY OF THE CARBUNCULAR Disease.—By L. Pasteur. A valuable and exhaustive contribution to the history of "carbuncular disease" or "anthrax"—one of the diseases which causes the greatest destruction of cattle in all countries. The nature, cause, and prevention of the affection fully treated. Contained in SUPPLEMENT **259**. Price 10 cents.

CONSTIPATION VIEWED AS A DISease *per se* and as an Exciting Cause of Disease. A valuable paper by Robert Bell, M.D., calling attention to a matter which is often overlooked in connection with this disorder, *i.e.*, the production of a whole host of distressing symptoms, and the development of what but for it might still remain latent disease. Illustrated by a series of cases which have come under the author's observation during the last six years, and giving the treatment adopted by him. Contained in SUPPLEMENT **224**. Price 10 cents.

NOTES OF HOSPITAL AND PRIVATE Practice in San Francisco. By H. Gibbons, Sr., M.D. Brief Records of Observation and Experience during eighteen years of Hospital Practice, treating of Pulmonary Consumption; Cough and Night Sweats; Hemorrhage; Foods and Drinks for Consumptives; Malarial Diseases; Intermittents; Tenacity of Intermittent Fever; Typhoid Fever; Rheumatism and Neuralgia; Diseases of the heart, and Jaundice. SUPPLEMENT, **193**. The same number contains articles on appearance of the Tongue in Disease; Aural Therapeutics, and Treatment of Strychnia Poisoning by Chloral Hydrate, Apomorphia, and Electricity. Price 10 cents.

COLD WATER IN TYPHOID.—BY J. W. Kibbee, M. D. An account of a peculiarly interesting case of typhoid and the author's method of treating it, and from the fortunate results of which he is led to the conclusion that all morbid phenomena attending fever of any name are directly due to excessive heat, and that the removal of the latter by water is a sure remedy. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **171**. Price 10 cents.

THE CARE OF YOUNG CHILDREN.—This paper is of special interest to parents and others who have young children in charge. It is full of practical and valuable advice, which followed will serve to prevent those diseases to which children are so liable in summer, and which are the causes of such great mortality among them. It points out the necessity of pure air for the child; what kind of food should be given and what kinds avoided; how various dietetic preparations are to be made; when and how the child should be weaned; how and when it should be bathed; and how it should be clothed; and the best kinds of food to select for the growing child. SUPPLEMENT, No. **192**. Price 10 cents.

BRONCHIAL ASTHMA.—A LECTURE delivered at the Medical Society of London, by Jno. C. Thorowgood, M. D., giving the author's views as to the causes, complications, effects of climate upon and the proper treatment of the disease, based on cases that have come under his own observation. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **171**. Price 10 cents.

TREATMENT OF ULCERS WITH A Saturated Solution of Chlorate of Potassium. By T. M. Rochester, M. D. Full Description of Treatment, with Explanation of Mode of Action of the Chlorate of Potash, and record of fourteen successful cases. SUPPLEMENT **155**. Together with Peroxide of Hydrogen in the Blood, Diarrhea in Children, etc. Price 10 cents.

BILIOUS DISEASES. — WHAT ARE They, and why so Called? By J. H. Nowlin, M. D. Many Bilious Diseases, so called, in which the Liver is not involved. A Protest against Quack Treatment, etc., and an attempt to Correct a Grave Popular Conception. SUPPLEMENT **152**. Price 10 cents.

PEROXIDE OF HYDROGEN IN THE Blood. By John Day, M.D. Paper read before the Medical Society of Victoria. An attempt to Explain the Action of certain common Remedies. Condition of Oxygen in the Blood, with interesting Chemical Experiments. Peroxide of Hydrogen in the Fats of the Blood. Importance of Fat in the Animal Economy. How the Coloring Matter of the Blood produces an Important Chemical Change. Therapeutic Effect of Fats and Oils, as Cod Liver Oil, Oil of Turpentine, common Resin, the Resin of Guaiacum, Myrrh, and Ether. SUPPLEMENT **155**. Together with Treatment of Ulcers with Clorate of Potassium, Diarrhea in Children, etc. Price 10 cents.

DENTITION.—BY RICHARD A. F. PENrose, M.D. A very instructive lecture delivered before the Medical Class of the University of Pennsylvania, upon a subject of vital importance to the welfare of the Infant in both health and disease. SUPPLEMENT, No. **167**. Price 10 cents.

FOOD, PHYSIOLOGY, AND FORCE.—By Dr. E. L. Sturtevant. An interesting and comprehensive paper presenting many valuable and instructive facts. Food a form of force, the animal a product of force or forces; definition of "work;" the amount of force derived from various articles of food. Table of food, showing total mechanical work which the combustion in the body of one pound of each is capable of producing outside the body; the weight of the body; object of respiration and circulation; phenomena of respiration and circulation; animal heat; consumption of force in standing and walking; changes in the amount of food to furnish force for purpose of labor, amount of food required by man and animals; the force-producing powers of milk and beef compared; proper protection of animals in winter a cheaper fuel than corn or hay. SUPPLEMENT, No. **186**. Price 10 cents.

DYSPEPSIA.—BY DR. C. F. KUNZE. Symptoms. Appetite Diminished. Stomach Digestion much slower than Normal. Constipation. Symptoms in Children. Chronic Cases. Dyspepsia as caused by too much Food: by Indigestible Food; by General Derangement: by Altered Conditions of Innervation. Treatment. Nourishment should be Easily Digestible; taken Little at a Time and Digested before more is taken. Necessity of Few and Plain Dishes. Treatment when Stomach is Overloaded. Aiding Gastric Juice. Treatment in Febrile Diseases Contained in SUPPLEMENT **129**. Price 10 cents.

THE ART OF PRESERVING THE EYEsight.—Adapted from the French of Arthur Chevalier. Illustrated with 93 engravings. A plain, comprehensive Treatise, explaining the Anatomy of the Eye; the Phenomena of Vision, and the Reflection, Refraction, and Dispersion of Light; the Ophthalmoscope and its Use; Diseases of the Eye, and Treatment; Long and Short Sight, with Instructions; Cataract and Astigmatism; Manufacture of Spectacles; Colored Glasses and their Use; Number and Focio of Lenses and their Mountings; Hygiene of the Eye. Valuable Directions for all; the Hygiene of the Eye. Simple Home-treatment for Weak Eyes. Care for the Eyes of Children and Infants. What Lamps should be Used. How to Bathe the Eye. Instructions to the Aged. Extraction of Foreign Bodies from the Eye. Eye-washes and their composition. Recipes for Eye-washes and Directions for their Application. The whole contained in SUPPLEMENTS **125, 127, 130, 136, 139, 142, 144, 147**. Price 10 cents each; 80 cents for the series.

LECTURES ON PARALYSIS AND CONvulsions, as Effects of Organic Diseases of the Brain. By C. E. Brown-Sequard, M.D. Delivered at Bellevue Hospital Medical College, New York. Being reports of eight celebrated lectures of importance and value. Contained in SUPPLEMENTS **101, 102, 103, 104, 109, 112, 119, 121**. Price 10 cents each.

THE CONDITIONS OF HEALTH IN THE Infant—A lecture delivered at Jefferson Medical College, Philadelphia, by Wm. B. Atkinson, M.D. This lecture, upon a subject on which the books are almost completely silent, contains a careful study of the frame of the child in a healthy state, from its birth up to the time when it and its diseases may no longer be regarded as peculiar, but as coming under the heading of diseases of adult life. It treats of: The appearance and peculiarities of the infant at the moment of its birth; its rapid rate of growth; its weight; average weight of male and female infants; the skin and its color, and its vascular nature; the bones, their characteristics; the pulse of the new-born-child; the respiration at different ages; the digestive system; the secretion of saliva and the period at which this occurs; the act of nursing; the state of the bowels, and the peculiarities of the urine; the early development of the child's senses; the breath, the tongue, the mouth, the lips, and the characters they should exhibit; the susceptibility of the infant to pain; the approach of first dentition; change of food; beginning of articulation; locomotion. SUPPLEMENT, No. **163**. Price 10 cents.

CONSTITUTIONAL DISEASES.—BY D B. St. John Roosa, M.D. An interesting paper in which the author discusses the value of glasses in the cure of disease. Contained in full in SUPPLEMENT **252**. Price 10 cents.

© 1881 SCIENTIFIC AMERICAN, INC

These papers may be had at THE SCIENTIFIC AMERICAN Office, New York, or may be ordered through any Bookseller or Newsdealers. In ordering, please be particular to specify **the Number** of the Supplement that contains the paper desired. Promptly sent by mail to any part of the world. Price Ten Cents each Number.

Medicine, Hygiene, Surgery, Etc.

MEDICAL USES OF SALICYLIC ACID.—SUPPLEMENT **162.**

BALDNESS AND ITS TREATMENT.—By Dr. Geo. H. Rowe. SUPPLEMENT **161.**

MILK AS A VEHICLE OF CONTAGION. By A. R. Beeker, M.D. SUPPLEMENT **160.**

SUGGESTIONS FOR PREVENTING THE Spread of Scarlet Fever.—SUPPLEMENT **172.**

PEROXIDE OF HYDROGEN AS A DISinfectant and Deodorant.—By John Day, M.D. SUPPLEMENT **166.**

OBESITY.—HOW CAUSED, HOW CURed. SUPPLEMENT **166.** Price 10 cents.

SKIN GRAFTING.—BY G. W. GARRISon, M.D.—Cases requiring skin grafting. Plan of procedure. How long to continue transplarting. SUPPLEMENT **164.** Price 10 cents.

DIPHTHERIA.—THE BROOKLYN Treatment. By Paul H. Kretzschmar, M.D. An account of a mode of treatment of this dread disease which has proved very effective. SUPPLEMENT **191.** Price 10 cents.

AURAL THERAPEUTICS.—A CLINICAL lecture, by Laurence Turnbull, M.D., on some of the remedies which have proved specially valuable in ear diseases. SUPPLEMENT **193.** Price 10 cents.

APPEARANCE OF THE TONGUE IN Disease.—By J. A. Henning, M.D. SUPPLEMENT **193.** Price 10 cents.

NEURALGIA.—METHOD OF TREATment. By Dr. J. W. Hickman. SUPPLEMENT **196.** Price 10 cents.

SUSPENDED ANIMATION.—BY BENjamin Ward Richardson. An interesting paper on what is known, by experiment, as to the possibility of suspending animal life. SUPPLEMENT **185.** Price 10 cents.

AMALGAMS.—BY DR. CHARLES J. Essig. A paper of great value to dentists. SUPPLEMENT **183.** Price 10 cents.

A PLEASANT REMEDY FOR TOOTHache.—By J. C. Osborn, M.D. SUPPLEMENT **185.** Price 10 cents.

RASHES PRODUCED BY DRUGS IN Daily Use. SUPPLEMENT **176.** Price 10 cents.

THE CIRCULATION OF THE BLOOD.—Lecture by Prof. E. J. Marcy, presenting certain features of the subject not commonly known. With four figures. SUPPLEMENT **212.** Price 10 cents.

ASPHYXIA IN THE NEWLY BORN.—A speedy method of prevention. By Dr. Harvey L. Byrd. With three cuts. SUPPLEMENT **215.** Price 10 cents.

A CURE FOR CATARRH.—BY HANS M. Wilder. SUPPLEMENT **216.** Price 10 cents.

NOVEL SURGICAL INSTRUMENT.—Description and figure of an apparatus for lighting up the dark cavaties of the body. SUPPLEMENT **210.** Price 10 cents.

THE MOTOR FUNCTIONS OF THE Brain.—By. Dr. François Franck. An interesting discussion of the relations that exist between certain regions of the brain and the exercise of voluntary movements. With six figures. SUPPLEMENT **210.** Price 10 cents.

DIGESTION AND DYSPEPSIA.—BY Charles Richet. A paper full of valuable suggestions on the subject of digestion and the hygiene of the digestive organs. SUPPLEMENT **199.** Price 10 cents.

CEMENTS FOR THE TEETH.—BY DR. W. H. Rollins. SUPPLEMENT **200.** Price 10 cents.

FUCHSIN IN BRIGHT'S DISEASE.—SUPPLEMENT **259.** Price 10 cents.

EASY METHOD OF DETECTING BLOOD Stains.—By Prof. D. S. Kellicott. SUPPLEMENT **261.** Price 10 cents.

MANUFACTURE OF AMMONIA BY means of Nitrogen contained in the air.—By J. P. Rickmann. With illustrations of apparatus. SUPPLEMENT **254.** Price 10 cents.

HEMLOCK IN THE TREATMENT OF Cancer.—By H. Kennedy, M.B. SUPPLEMENT **250.** Price 10 cents

LEAD POISONING.—A CLINICAL LECture by Dr. Wm. Pepper. SUPPLEMENT **235.** Price 10 cents.

CURIOUS FOODS USED BY VARIOUS People. SUPPLEMENT **200.** Price 10 cents.

RABIES.—CAUSE AND PROBABLE Preventive.—B. L. L. Dorr, M.D. SUPPLEMENT **310.** Price 10 cents.

CONNECTION OF THE BIOLOGICAL Sciences with Medicine.—By Prof. Huxley SUPPLEMENT **300.** Price 10 cents.

VACCINATION OF ANIMALS.—ADdress by Prof. Pasteur. SUPPLEMENT **300.** Price 10 cents.

TYPHUS FEVER IN NEW YORK.—SUPPLEMENT **298.** Price 10 cents.

DISEASES OF THE EAR.—BY SAMUEL Theobald. SUPPLEMENT **294.** Price 10 cents.

NEW FLEXIBLE STETHOSCOPE.—Illustrated. SUPPLEMENT **302.** Price 10 cents.

TREATMENT OF TETANUS.—SUPPLEMENT **302.** Price 10 cents.

OCULAR SYMPTOMS IN DIFFERENT Diseases.—SUPPLEMENT **297.** Price 10 cents.

CATCHING COLD.—BY DR. CARL SEIler. SUPPLEMENT **297.** Price 10 cents.

NITROUS OXIDE FOR DENTAL AND Surgical Operations.—SUPPLEMENT **297.** Price 10 cents.

BACTERIA AS A CAUSE OF DISEASE in Plants.—By Prof. T. J. Burrill. Illustrated. SUPPLEMENT **297.** Price 10 cents.

HOW TO PREVENT THE RAPID Spread of Fire. By P. T. Wight. SUPPLEMENT **205.** Price 10 cents.

ARROW WOUNDS.—BY H. S. KILbourne, M.D., U.S.A. An interesting lecture on a branch of surgery not treated of in text books. SUPPLEMENT **295.**

PHENOMENA OF HYPNOTISM.—Illustrated. SUPPLEMENT **295.** Price 10 cents.

PASTEUR'S EXPERIMENTS IN PREventive Inoculation.—SUPPLEMENT **295.** Price 10 cents.

THE TREATMENT OF ACUTE RHEUmatism.—By Alfred Stille, M.D. SUPPLEMENT **299.** Price 10 cents.

OCULAR SYMPTOMS IN DIFFERENT Diseases.—By Dr. Gorecki. SUPPLEMENT **297.** Price 10 cents.

HOSPITAL OF ST. ELOI, AT MONTPELlier, France. By F. J. Monat, M.D. With bird's-eye view of the buildings. SUPPLEMENT **307.** Price 10 cents.

CURE FOR OPIUM HABIT.—SUPPLEMENT **304.** Price 10 cents.

TOPICAL MEDICATION IN PHTHISIS.—SUPPLEMENT **286.** Price 10 cents.

DIPHTHERIA, REMEDY FOR.—SUPPLEMENT **307.** Price 10 cents.

HOW WE ARE POISONED.—BY DR. C. A. Greene. SUPPLEMENT **283.** Price 10 cents.

ASTIGMATISM.—BY C. A. BUCKLIN, M.D.—With Standards for testing distant vision. SUPPLEMENT **301.** Price 10 cents.

PHILOSOPHY OF INSANITY.—BY DR. John Sanderson. SUPPLEMENT **308.** Price 10 cents.

SIMPLE METHOD TO STAUNCH ACCIdental Hemorrhage.—Illustrated. By Edward Borck, M.D. SUPPLEMENT **299.** Price 10 cents.

RHEUMATISM, TREATMENT OF.—BY Alfred Stille, M.D. SUPPLEMENT **299.** Price 10 cents.

TREATMENT OF TETANUS.—BY DR. Ria. SUPPLEMENT **302.** Price 10 cents.

MERCURIAL FUMIGATION IN DIPHtheria.—By J. Corrin, M.D. SUPPLEMENT **297.** Price 10 cents.

CONSUMPTION, IS IT A CONTAGIOUS Disease, and What Can be Done to Prevent its Ravages.—By B. Cogshall, M.D., Flint, Mich. SUPPLEMENT **297.** Price 10 cents.

MISCELLANEOUS.
Evolution and Science Theories, Education Exhibitions, Etc.

EVOLUTION AND HUMAN ANATOMY. By Stanford E. Chaillé, A.M., M.D. A powerful array of facts in favor of evolution, derived from a philosophical study of Human Anatomy. The indelible marks of man's lowly origin to be found in three different and neglected departments of Anatomy—Embryology, Teratology, and Rudimentary Organs. *Embryology.*—The origin of man from an ovule or cell differing in no respect from that of other animals; the hatching of the egg successively presents the same forms of animal life that are disclosed in the successive strata of geology; the human embryo successively taking on the organization of a fish, of an amphibian, a reptile, and a mammal; a detailed study of each of these phases in the human embryo. *Teratology* (anomalies)—The monster shown to be due sometimes to excessive, sometimes to perverted, and sometimes to defective embryonic development; the human embryo in its earliest stages destitute of head, brain, heart, and extremities; every variety of deficiency in these or other parts may occur, and produce monstrosities; most flowering plants and many inferior animals "double sexed," and true hermaphroditism also possible in man; examples of the occurrence in man of supplementary organs that are characteristic of other animals; all the distinctive peculiarities of the myology of the anthropomorpha occasionally met with as varieties in man. *Rudimentary Organs.*—Organs of this kind found in all kinds of animals and plants; they are perfectly useless, and at times detrimental to their possessor, and are relics of once useful organs in lower forms of allied animals and plants; the presence of these relics in the embryo and adult is convincing evidence of evolution; numerous examples of such relics in man; the light that these facts throw on the subject under consideration; these facts, however, are only a fraction of the evidence in favor of evolution. What chemistry, microscopy, morphology, and geology teach in addition. Contained in SUPPLEMENT **168.** Price 10 cents.

A SPECULATION ON PROTOPLASM.—By Persifer Frazer, Jr. A thoughtful essay in which the author, after a review of the known Chemical and Physical Properties of Protoplasm—the wonderful substance which composes the simple cell of plant and animal—offers some original speculations for the consideration of thinkers; such, for instance, as the possibility of cells being composed of ultra-miscroscopic geometrically regular forms: the possibility, through chemical changes in Protoplasm, of living creatures being formed colder than frozen mercury, or hotter than molten platinum, and thus fitted to endure the temperature of asteroids on the one hand, or of the sun on the other, etc., etc. Contained in SUPPLEMENT **187.** Price 10 cents.

THOUGHTS ON OUR CONCEPTION OF Physical Law.—By Prof. Francis E. Nipher. An address delivered before the Alumni of the State University of Iowa, and wherein the author earnestly advocates the cultivation of "Intellectual Modesty," not merely because it is one of the brightest ornaments of the human mind, but because of its vital connection with another cardinal virtue—intellectual honesty. An able and interesting essay. Contained in SUPPLEMENT **168.** Price 10 cents.

SCIENCE AND THE IMPROVEMENTS which it can Effect in our Trades and in the Conditions of our Workmen.—A very suggestive address delivered by Prof. W. E. Ayrton, at the City and Guilds of the London Institute, and in which the author points out to the British workmen why most of the valuable inventions are of American origin, and how necessary it is that English artisans should look to their studies as a means of making themselves educated workmen and not mere copying machines. The real aim of education shown to be the mental training which it insures, and not accumulation of facts; and the proof of this seen in the numerous inventions emanating from educated men who have a small knowledge of the details of the science to which the invention belongs. The importance of a general knowledge of principles pointed out. Contained in SUPPLEMENT **211.** Price 10 cents.

MYTHOLOGIC PHILOSOPHY.—VICEPresidential Address of Prof. J. W. Powell, read before the American Association for the Advancement of Science, August, 1879. SUPPLEMENTS **193** and **194.** Price 10 cents each.

INDUSTRIAL EDUCATION, A NEW Feature in.—A description of the new system of hand education adopted by the Society for Ethical Culture in the instruction of young children in the principles underlying all mechanical arts and occupations; an improvement on the well-known Russian system. With fifteen diagrams showing the mode of instruction in the carving of geometrical figures in clay. Contained in SUPPLEMENT **230.** Price 10 cents.

THE FRENCH UNIVERSAL EXHIBItion of 1878.—Conditions for exhibitors; Insurance against Fire, Accident, etc. Classification of Exhibits. Police. Financial Condition of the Exhibition and Cost of Buildings, etc., with Two Engravings of the Principal Entrances. SUPPLEMENT **100.** Price 10 cents.

INTERNATIONAL MEDICAL AND Sanitary Exhibition, London.—Illustrated. SUPPLEMENT **298.** Price 10 cents.

THE SCIENTIFIC AMERICAN REFERence Book, a bound book of 144 pages for 25 cents. On receipt of 25 cents we send by mail, post-paid, a copy of a handsome little bound volume, entitled the SCIENTIFIC AMERICAN REFERENCE BOOK, containing 144 pages, illustrated with engravings, and forming one of the cheapest and most valuable books of condensed reference ever printed. Among its contents are:

1. *The Census of the United States*, by States, Territories, and Counties, *in full*, showing the area of the several States. *Also, Tables of Cities* having over 10,000 inhabitants. Compiled from the Census.

2. *Table of Occupations.*—Showing the principal occupations of the people of the United States, and the number of persons engaged in each occupation. Compiled from the last Census.

3. *The Patent Laws* of the United States in full, with Directions How to Obtain Patents, Official Rules, Costs, etc.; Forms for Applications for Patents and Caveats, Directions How to Introduce and Sell Inventions, Forms for Assignment, in whole and part; Licenses, State, Town, County, and Shop Rights; Rights of Employer and Employes in respect to Inventions; State Laws concerning Patents; General Principles applicable to Infringements; Synopsis of the Patent Laws of Foreign Countries, Costs, Procedure.

4. *The Ornamental Design Patent Law* (full text).—Costs and Procedure for securing Design Patents for Ornamental Productions, such as Designs for Textile Fabrics, Patterns for Wood and Metal Work, New Shapes and Configurations of any article of Manufacture, Prints, Pictures, and Ornaments, to be printed, woven, stamped, cast, or otherwise applied upon machinery, tools, goods, fabrics, manufactures.

5. *The United States Trade-Mark Law* (full text).—With Directions, Proceedings, and Expenses for the Registration of Trade-Marks of every description.

6. *The Label Copyright Law* (full text).—With Directions, proceedings, and Cost of Registering Labels for Goods, Medicines, and Merchandise of all kinds.

7. *The General Copyright Law* of the United States (full text), for securing Copyrights on Books, Pamphlets, Charts, Maps, Photographs, Pictures, Engravings, Works of Art, etc. With Directions, Costs, etc.

8. *The Principal Mechanical Movements*, Described and Illustrated by 150 small diagrams, of great value to Inventors and Designers of Mechanism.

9. *The Modern Steam Engine.*—With Engravings showing all the parts, names, etc., and a brief history of the Invention and Progress of Steam Power.

10. *Horse Power.*—Simple and plain rules for Calculating the Horse Power of Steam Engines and Streams of Water.

11. *Knots.*—Presenting engraving of forty-eighs different kinds of Rope Knots, with explanations at to tying.

12. *Tables of Weights and Measures.*—Troy Weight; Apothecaries' Weight; Avoirdupois, or Commercial Weight; French Weights · United States Standard; Dry Measure; Land Measure; Cubic Measure; Liquid Measure; French Square Measure; French Cubic, or Solid Measure; Measuring Land by Weight, with engraving of a section of the English and a section of the French rules, of equal lengths.

13. *Valuable Tables.*—1. Table of Velocity and Force of the Wind; 2. Table of the Specific Gravity and Weight per Cubic Foot and Cubic Inch of the principal substances used in the Arts; 3. Table of the Heat-Conducting Power of Various Metals and other Solids and Liquids, 4. Table of the Mineral Constituents absorbed or removed from the Soil, per acre by different crops; 5. Table of Steam Pressures and Temperatures; 6. Table of the Effects of Heat upon various bodies, melting points, etc.; 7. Table of the Heat and Electrical Conductivity of various metals.

14. *Geometry in Brief*, as Applied to Practical Purposes. With illustrations.

15. *Electrical Batteries and Magnets.*—Plain directions showing how any person may, at a cost of a few cents, make and put in operation an effective Electrical Battery, prepare and wind Electrical Magnets, make a Telegraph, and perform a variety of interesting electrical experiments.

16. *Interesting Illustrated Articles.*—1. The United States, its area, principal dimensions, length of coast, rivers, steam navigation, railways, telegraphs, with outline Map of the United States. 2. View of the Capitol at Washington, with dimensions and brief history. Views of the Patent Office, interior and exterior, dimensions and brief history Views of prominent buildings and streets, New York and Washington. Distinguished American Inventors, with portraits of Franklin, Whitney, Fulton, Wood, Blanchard, Winans, McCormick, Goodyear, Morse, Howe, Lyall, Eads, with biographies and figures of their inventions.

17. *Miscellaneous Information.*—Force of Expansion by Heat; Small Steamboats. Proper Dimensions of Engines, Boilers, Propellers, Boats. Incubation, Temperature of. To Make Tracing Paper; Constituents of Various Substances; Friction, how produced, and Rules for Calculation; Specific Heat Explained; Specific Gravity of Liquids, Solids, Air, and Gases; Gunpowder—Pressure, Heat, and Horse Power of; Copying Ink, to make; Heat, its mechanical equivalent explained; Molecules of Matter, size and motion explained; Lightning and Lightning Rods—valuable information; Value of Drainage explained; Amount of Power at present Yielded from Coal by best Engines; Sound, its Velocity and Action; Liquid Glues, Recipes; Value of Brains; Properties of Charcoal; Height of Waves; Speed of Electric Spark, etc.; Valuable Recipes.

THE SCIENTIFIC AMERICAN REFERENCE BOOK, price only 25 cents, may be had of News Agents in all parts of the country, and of the undersigned. Sent by mail on receipt of the price.

All the above or any desired numbers of the SCIENTIFIC AMERICAN SUPPLEMENT can be obtained through any Newsdealer, or at this Office. Price 10 cents each. In ordering, please be particular to give the number of the SUPPLEMENT that contains the article desired.

Any desired number of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent postpaid to any part of the world on receipt of 10 cents. Address MUNN & CO., New York.

MUNN & CO., Publishers,
No. 37 PARK ROW, NEW YORK.

MATERIALISM AND ITS LESSONS.—By Dr. Henry Maudsley. A calm and impartial review of the doctrine of Materialism by one who believes that "Materialism," when properly understood, far from being a menace to morality, only sets before man a higher intellectual aim than he is ever likely to reach by spiritual paths. The author treats his subject under the following headings: Mental Effects of Injury to the Brain; The Moral Character first Impaired; How Disease injures the Moral Character; Mental Effects of Paralysis; Effects of Alcohol and Opium on the Moral Sense; Dependence of Mind and Spirit on Organization; the doctrine of a Separate Spirit; the Hope of Immortality; Lessons of Humility and Reverence; Brain Differences and Values; Teachings of Science Concerning the Growth of Moral Character; Causes of Family Development and Degeneracy; Hereditary Antecedents; How Mental Derangement is produced by Absence of Moral Feeling; Obedience to the Higher Laws imperatively required; Stern and Uniform Reign of Law in Nature; the Events of the Moral World as a Matter of Law and Order; the Good of Mankind and the True Object of Life. Contained in SUPPLEMENT, No. **197.** Price 10 cents.

THE BEGINNING OF LIFE.—A REVIEW of the doctrine of Evolution. By the eminent Prof. Edmond Perrier, of the Museum of Natural History of Paris. What are the simplest forms of life? Our present ideas of "living beings" and "organisms." Protoplasm. Discovery of the first Moner—*Protogenes.* Protamœba. Huxley's Bathybius. Myxiodictium. Reproduction of moners described and illustrated. The Protomonas. The Vampyrellas. Reproduction of Protomyxa, and Myxastrum. The great abundance of these simplest forms of life and their possession of properties in common. Beings that have acquired individuality could not have been produced spontaneously. Can non-individualized protoplasm spring up spontaneously? The opinion of chemists. The differences between protoplasm and chemical compounds. The Rhizopods and their possession of a nucleus and nucleolus. Differences between Amœbas and Protamœbas. The Actinophrys sol. Actinosphærium Eichhornii. An able and interesting article, illustrated with seven engravings, showing some of the more wonderful and beautiful forms assumed by protoplasmic animals. Contained in SUPPLEMENT **188.** Price 10 cents.

THE THEORY OF EVOLUTION.—THE three great lectures delivered in New York, 1876, by Professor Huxley, on "The Theory of Evolution." SUPPLEMENTS **41, 42, 44.** Price 10 cents each, 30 cents for the three. These are the only scientific lectures delivered in America by Professor Huxley.

PARIS EXHIBITION PRIZES, 1878. Full Official List of the Awards in the American Department, enumerating Exhibits and Names and Addresses of Exhibitors, with kind of Prize awarded in each case. Contained in SUPPLEMENTS **149, 150.** Price 10 cents each.

OFFICIAL SIGNAL RULES FOR VESsels.—Lights for Sea-going Steamers; for Towing Steamers; for steamers not sea-going; for Mississippi steamers; for sailing vessels. Steering Rules Instructions in full for all vessels and boats; and what the law requires in their management, and their equipment of lights, signals, fog horns, etc Also, Raising of the Vanguard; Prevention of Collisions at Sea; Improved Ship's Bridge; Life Boats, etc., etc. SUPPLEMENT **63.** Price 10 cents

SCIENTIFIC AMERICAN SUPPLEMENT.—Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. May also be had or ordered through booksellers and newsdealers everywhere. MUNN & CO., Publishers, 37 Park Row, New York.

MECHANICAL DRAWING.—BY PROF. C. W. MacCord, of the Stevens Institute of Technology. A series of new, original, and practical lessons in Mechanical Drawing, accompanied by carefully prepared examples for practice, with directions, all of simple and plain character, intended to enable any person, young or old, skilled or unskilled, to acquire the art of drawing. No expensive instruments are involved. Any person with slate or paper may rapidly learn. The series embodies the most abundant illustrations for all descriptions of drawing, and forms *the most valuable treatise upon the subject ever published, as well as the cheapest.* The series is illustrated by upward of 450 special engravings, and forms a large quarto book of over one hundred pages, uniform in size with the SCIENTIFIC AMERICAN. Price, stitched in paper, $2.50. Bound in handsome stiff covers, $3.50. Sent by mail to any address on receipt of price. Address Munn & Co., Publishers, 37 Park Row, New York. Office of the SCIENTIFIC AMERICAN.

For the convenience of those who do not wish to purchase the entire series at once, we would state that these valuable Lessons in Mechanical Drawing may also be had in the separate numbers of SUPPLEMENT, at 10 cents each. By ordering one or more numbers at a time, the learner in drawing may supply himself with fresh instructions as fast as his practice requires. These lessons are published successively in SCIENTIFIC AMERICAN SUPPLEMENTS **1, 3, 4, 6, 8, 9, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 58, 60, 62, 65, 69, 74, 78, 84, 91, 94, 100, 101, 103, 104, 105, 106, 107, 108, 134, 141, 174, 176, 178.**

THE SCIENTIFIC AMERICAN SUPPLEMENT dates from January 1st, 1876. Two volumes are issued annually. We can supply all of the back volumes, or any single volume, at the following prices: for each volume, stitched in paper covers, **$2 50**; the same bound in stiff covers, **$3 50.** Up to January 1st, 1882, twelve volumes of the Supplement had been issued, containing the following numbers:

Volume 1 contains Supplements numbers 1 to 26 inclusive.

Volume 2 contains Supplements numbers 27 to 52 inclusive.

Volume 3 contains Supplements numbers 53 to 78 inclusive.

Volume 4 contains Supplements numbers 79 to 104 inclusive.

Volume 5 contains Supplements numbers 105 to 130 inclusive.

Volume 6 contains Supplements numbers 131 to 156 inclusive.

Volume 7 contains Supplements numbers 157 to 182 inclusive.

Volume 8 contains Supplements numbers 183 to 208 inclusive.

Volume 9 contains Supplements numbers 209 to 234 inclusive.

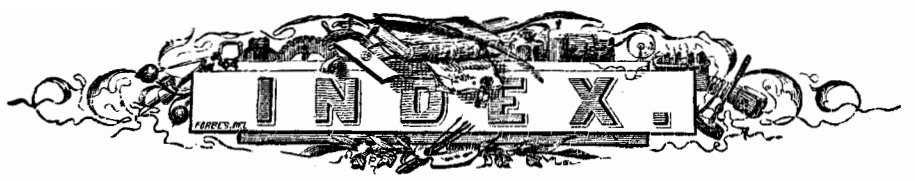
Volume 10 contains Supplements numbers 235 to 260 inclusive.

Volume 11 contains Supplements numbers 261 to 286 inclusive.

Volume 12 contains Supplements numbers 287 to 313 inclusive.

Sent to any part of the world on receipt of price above mentioned. MUNN & CO., Publishers, 37 Park Row, New York.

© 1881 SCIENTIFIC AMERICAN, INC



ILLUSTRATIONS.

A

Air currents, to diffuse..... 354
Air pump, improved..... 19
Amateur mechanics..... 391
American industries, 117, 148, 255, 264, 271, 276, 383, 386
American Institute, exhib. at, 271, 276
Ancient Roman pottery..... 183
Annunciator, speaking tube..... 82
Anvil, punch, and shears, comb.. 290
Aqueduct, Washington, Union arch..... 47
Arms, safety, self-cocking..... 294
Artistic mantelpiece..... 375
Assay, volumetric, of bullion..... 55
Astronomer royal, the new..... 242
Atlanta exhibition, the..... 343

B

Balance, simple, a..... 99
Band saw machine, new..... 67
Bath box for photo purposes..... 99
Battery, compact, a..... 150
Battery, improved, an..... 198
Battery, Maiche's..... 68
Battery, portable, new..... 182
Bed, invalid, Davis..... 274
Bed, spring, improved..... 131
Beetle, carpet, the spread of 33
Bell telephone, antecedents of.. 83
Bending machine for iron, etc... 98
Beveling machine, plate glass.... 310
Bird parasites, eggs of..... 183
Boat, electric, the..... 23
Boat, velocipede, in Boston..... 263
Boiler, a, explosion in Pottsville, 34
Boiler explosion, cylinder..... 20
Boiler explosion, experimental.. 403
Boiler explosion in Ohio..... 384
Boiler explosion on a dry dock.. 209
Boiler explosion, Watertown.... 162
Book rest, improved..... 326
Boot and shoe making by mach'y 223, 228
Bottle, novel, a..... 100
Bottle wrapper, novel..... 371
Brass, burnished, some things in. 391
Breakfast set of Sevres porcelain 279
Bridge, Suspension, Niagara..... 31
Bullion, alloys, etc., vol. assay of 35

C

Cancelling stamp, improved..... 67
Candles, how to make 383, 386
Car coupling, new..... 262
Car, freight, improved..... 166
Carpet beetle, the, spread of..... 33
Car starter, improved..... 86
Car truck, improved..... 22
Car wheels, casting..... 163
Cast iron boiler heads..... 65
Cattle ringer, novel..... 18
Cephalopoda, peculiarities of the 167
Chair, easily made, a..... 210
Chair, window, improved..... 277
Chart rack, novel..... 4
Chicago waterworks 399
Cider, good, how to make..... 133
Clock-dial mechanism, electric... 295
Cloth cutting machine, new..... 242
Cloth register, novel..... 182
Comet, great, of 1881, views of .. 69
Compression riveter, portable... 322
Condensed milk..... 99
Condor, the 297
Copper ores, electro assay of..... 99
Copying process, stencil..... 65
Coral reefs, how built 151
Coral worm, great..... 151
Cord tightener, improved..... 262
Cork extractor, novel..... 67
Cotton and its future..... 207, 211
Cotton, harvesting, machines.207, 211
Cotton plant, the, and its fiber .. 273
Cotton stalk cutter and fuller.... 342
Cremating furnace, garbage..... 1
Cut-off, engine, new..... 294
Cut-off for electric lamps..... 226

D

Damper, improved..... 355
Decorations, panel, Eaton Hall.. 39
Demagnetizing watches 134
Depolarization of electrodes. ... 407
Desks, school, improvements in.. 178
Device for operating tool rests... 291
Dinner bucket, improved..... 322
Dividers and callipers, improved. 67
Diving apparatus, new..... 278
Door latch, improved..... 130
Doors, hatchway, improved..... 295
Double-driving tricycle 372
Draught appliance for stoves..... 291
Drawing pen, improved..... 259
Drop press, new..... 86
Drumming log, the 361
Drying cylinder, steam, explosion 88
Ducks, elder, the..... 247
Dynamic electricity..... 407
Dynamo-electric machine, new.. 246
Dynamometer, optical..... 114
Dynamo, new, steam, Edison's... 367

E

Earth stars..... 119
Edison's new steam dynamo..... 367
Eggs of bird parasites..... 183
Elder ducks, the..... 247
Electric clock-dial mechanism... 295
Electric generator, improved.... 166
Electric light for the stomach.... 281
Electrical exhibition at Paris. 175, 377
Electrical exhib., international.. 159
Electrical induction by stress .. 6
Electrical magic..... 327
Electricity by magnetic induction, 351, 356
Electricity, stored-up..... 23
Electrodes, depolarization of.... 407
Electro-massage..... 54
Elias magneto-elect. machine.... 403
Engine cut-off, new 294
Engine, stationary, beam..... 415
Exhibition at Atlanta, Ga 343
Exhibition, elect., international. 159
Exhibition, semi-centennial...271, 276
Exhibits at Amer. Institute...271, 276
Expansion voltameter 22
Explosion, boiler, experimental.. 403
Explosion, boiler, in Ohio..... 384
Explosion, boiler, on a dry dock. 209
Explosion, boiler, Watertown .. 162
Explosion, dust, in Ehret's brew'y. 113
Explosion of a boiler in Pottsv'e. 34
Explosion of a cylinder boiler.... 20
Extract of meat, Liebig's mf'y. 79, 84

F

Fairbairn, grate bar..... 358
Faure battery, the..... 28, 118
Feed water regulator, improved. 18
Fence, improved..... 147
Fences, iron, improvement in.... 118
Fenian infernal machines 179
Filter, improved..... 147
Firearms manufacture..... 143, 148
Fish, sleeping..... 231
Fish, sur', the great..... 361
Floating, easy, secret of..... 101
Flower stand, improved..... 210
Fly, deadly, a..... 196
Flying machine, electric..... 195
Flying squirrel, the..... 409
Fontaine locomotive, the..... 230
Freight car, improved..... 166
Fruit picker, novel..... 102
Fruit press, new..... 146,
Furnace, cremating, garbage..... 1
Furnaces, steam boiler, imp. in... 5

G

Galvanometer, new..... 354
Garbage cremating furnace..... 1
Gas, lighting by electricity..... 38
Gastroscope, the 281
Generator, electric, improved.... 166
Glove fastener, new..... 50
Glove, husking, new..... 374
Governor, improved..... 228
Graduating apparatus, new..... 258
Grain crop, its com. importance.. 303
Grate bar, Fairbairn..... 358
Guacharo, or fat bird, the..... 135
Gun stock, adjustable, new..... 66
Gun stock, cushioned, improved. 342

H

Hatchway doors, improved..... 295
Hay fork, horse, improved..... 163
Hay rick, sheltering..... 87
Heat, distribution of in N. York 319
Heater and filter, lime-extracting 227
Hinge, spring, improved..... 50
H. M. S. Bacchante, steer. app.... 131
Hoisting apparatus, improved.... 38
Hook, detaching, and lock..... 342
Horse collars, improvement in... 4
How to make candles..... 383, 386
Husking glove, new..... 374

I

Improved life raft..... 422
Induction balance, new use for.. 66
Induction currents, app. for..351, 356
Industrial progress..... 271, 276
Industries, American. 117, 148, 255, 264, 271, 276, 383, 386
Infernal machines, Fenian..... 179
Insects, muscular power of..... 370
Invalid bed, Davis..... 274
Invention, an opportunity for 207, 211
Iron fences, improvement in..... 118
Iron, soldering, improved..... 371

J

Jewelry, patented improve. in... 243
Jointed pitch-board for squares. 259

K

Kaleidoscope, improved..... 290
Kid leather, how prepared..... 354
Knife, pocket, improved..... 326

L

Lamp, suspended, new reflector for..... 54
Lasting machine, new..... 63
Latch, door, improved..... 130
Lathes, tool rests of..... 291
Leather, kid, how prepared..... 354
Liebig's extract of meat..... 79, 84
Life-raft, improved..... 422
Life-saving lessons in physic..... 65
Light and heat, dist. of in N. Y.. 319
Light, distribution of in N. Y..... 319
Light, electric, for the stomach.. 281
Lock and rever, latch, comb..... 355
Lock, permutation, improved.... 182
Locomotive, central power...230, 245
Locomotive, Fontaine, the..... 230
Lubricator, improved..... 70

M

Magazines for coal stoves..... 98
Magic, electrical..... 327
Magic wheel, the..... 338
Magneto-electrical machine.... 403
Mantelpiece, artistic..... 375
Manufacture of wall paper..... 418
Meat, Liebig's extract of.....79, 84
Mechanical movement, new..... 50
Mechanics, amateur..... 391
Meteorological station, portable. 115
Milk, condensed..... 99
Moles, how they aid agriculture. 82
Mortising machine, Fiester's.... 262
Motor, novel, for fan blowers.... 146
Muscular power of insects..... 370
Myiasis in Argentine Republic... 196

N

Niagara Suspension Bridge..... 31
Nicol prism, nature, etc., of..... 325

O

Ohio, boiler explosion in..... 384
Ohio River, the..... 287
Oil well fittings, manuf. of...255, 264
Operculums and eye-stones..... 167
Optical dynamometer..... 114
Organ reed, new..... 307
Osprey, Amer, the home of..... 71

P

Panel decorat. for Eaton Hall.... 39
Pants, attachment for..... 116
Papers, wall, manufacture of..... 335
Paris electrical exhibition 185, 377
Paris opera, telephone at the..... 422
Phantasmascope, the..... 338
Pick, improved..... 354
Pig iron breaker, Blake's..... 402
Pillows and bolsters, impot in.... 146
Piston, steam engine, improved. 226
Pitch-board, jointed, for squares 259
Plant, cotton, the, and its fiber.. 273
Plate glass beveling machine.... 310
Pneumatic riveting machine..... 306
Pocket-knife, improved 326
Porcelain factory at Sevres..... 103
Porcelain urn..... 7
Porcelain, Sevres, breakfast set. 279
Portable compression riveter..... 322
Potato bug catcher..... 150
Pottery, Roman, ancient..... 183
Power, muscular, of insects..... 370
Prawn, common, and its parasite 151
Progress, industrial..... 271, 276
Pulley, safety, new..... 82
Pump, steam, double-acting..... 214
Pump, steam, double plunger.... 102
Punch, anvil and shears comb... 290
Punch, ticket, new..... 243

R

Rail fastening, new..... 115
Rain persuader, another..... 195
Reed, organ, new..... 307
Reel and receptacle, ticket..... 358
Reel, twisting, improved..... 359
Reflector, new, for suspended lamp..... 54
Registering stamp, automatic.... 179
River, Ohio, the..... 287
Riveter, compression, portable... 322
Riveting machine, pneumatic.... 306
Road scraper, new..... 6

S

Saw mills, band log, improved .. 95
School desks, improvements in.. 178
Screw and gear cutter 406
Scylla and Charybdis, the new... 275
Sea lamprey, the..... 87
Self-cocking arms, safety..... 294
Semi-centennial exhibition...271, 276
Sevres porcelain, breakfast set... 279
Sevres urn..... 199
Sevres vase..... 103
Sewing machine works, Davis, 111, 117
Ships, to prevent from sinking... 112
Shot case and distributor..... 311
Shutter fastener, improved..... 390
Shuttle worker, improved..... 130
Slotting machine, improved 70
Soldering iron, improved..... 371
Some things in burnished brass.. 391
Speaking tube annunciator..... 82
Spinning attach. for sewing machines 198
Spotted amblystone..... 329
Spring bed, improved..... 131
Spring hinge, improved..... 50
Squirrel, flying, the..... 409
Stamp, canceling, improved..... 67
Stationary beam engine..... 415
Steam boiler, furnaces, imp. in.. 5
Steam pipe, steamboat, breaking 149
Steering app. H. M. S. Bacchante 131
Stomach, the, electric light for.. 281
Stoves, coal, magazines for..... 98
Stoves, draught appliance for.... 291
Strainer for tubs and basins..... 4
Sulky, trotting, novel..... 374
Sun fish, the great..... 361
Suspension Bridge, Niagara..... 31

T

Tables, improvement in..... 258
Target, self-registering..... 196
Telegraph wire jointer..... 310
Telephone at the Paris opera..... 422
Telephone, Bell, antecedents of... 83
Telephone, the..... 260
Telephones, improvements in.... 198
Ticket punch, new..... 243
Ticket reel and receptacle..... 358
Tightener, cord, improved..... 262
Tile for illuminating purposes.... 323
Tire tightener, new..... 51
Tool, combination, improved.... 227
Tool, handy, a..... 118
Tool, new, a..... 118
Tool rests, device for operating. 291
Tools, new..... 307
Tricycle, double driving..... 372
Trotting sulky, novel..... 374
Turtle, a three hundred dollar.... 119
Tweezers, improved..... 274
Twisting reel, improved..... 359

U

Urn, porcelain..... 7
Urn, Sevres..... 199

V

Valve, automatic..... 146
Vase, Sevres..... 103
Velocipede boat at Boston..... 263
Vise, improved..... 311
Voltameter, expansion..... 22

W

Wagon spring, improved..... 19
Wall papers, manufac. of.....335, 418
Washington aqueduct, Union arch..... 47
Wasps and their nests..... 313
Watches, demagnetizing..... 134
Watch, solar De Combette's..... 196
Water power at Watertown..... 127
Wheel, magic, the..... 338
Window chair, improved..... 277
Wire jointer, telegraph..... 310
Woodpeckers..... 215
Worm wheel and gear cutter.... 406
Wrapper, bottle, novel..... 371

MISCELLANY.

Figures preceded by a *star* (*) refer to illustrated articles.

A

Academy of Sciences..... 353
Accident, singular, a 293
Accidents at the Paris Exhibition 320
Accidents, railroad..... 384
Accidents to railroad employes.. 243
Acid, carbonic, poisoning by..... 280
Acid, sulphurous, as a bleach.... 181
Acid, sulphuric, dangers of..... 90
Acid, tartaric, in diphtheria..... 53
Acme, the, of misinstruction. . 352
Accumulation, mutual, principle. 372
Acetate of soda, stove, an..... 307
Acorn-storing birds..... 342
A glance backward, etc..... 400
Agriculture and manufactures.... 352
Agricultural inventions 8, 51, 98, 153, 184, 229, 282, 309, 344, 378, 422
Air, currents, to diffuse..... *354
Air pump, improved..... *19
Air, comp, for elevated R. R..... 304
Air, moist, elec. conduct of 353
Air, the, navigation of 339
Air, weight of..... 266
Ajax metal..... 213
Alarm, torpedo steamer..... 96
Alaskan mines..... 378
Alcohol, distilling by ice..... 214
Alcohol, Dr. Andrew Clark on.... 120
Alligator hunting in Florida..... 279
Alligator leather..... 24
Alimentation, compulsory..... 415
Alphabet, the, in prehistoric Am. 195
Alum water 4
Amateur mechanics..... *391
Amber, imitation..... 197
American art in tools..... 256
American cattle, infection of..... 372
American enterprize 154
American gold work and jewelry 344
American health association.... 402
American industries, *117, *148, *255, *264, *271, *276, *383, 386
American Institute, exh. at..*271, 276
American Institute exhib. notes. 306
American Institute fair..... 71
American osprey, the, home of... 71
American Philological Society.. 68
American sardines..... 152
American Science Association... 161
American shoemaking mach.... 342
Amer. Society of Microscopists.. 256
American triumph, an..... 389
Ammonia in pulmonary diseases. 375
Ancient great lake in the west... 375
Ancient Roman pottery..... *183
Ancients, the, longevity of..... 308
A new source of glucose 415
Animals, motions in 49
Annunciator, speaking tube..... *82
Another new comet 263
Anthracite, another trial of the.. 113
Anthracite industry, the..... 176
Antimony, American..... 81
Antiquarian researches in Mexico 39
Antiquities, American, study of.. 185
Antiseptic, cheap..... 296
Ants as fruit growers' friends.... 37
Ants, curious observations on .. 71
Ants, military, of the Amazon... 314
Anvil, punch and shears comb..*290
A phosphor-bronze steamer..... 419
Aquarium cement..... (10) 91
Aqueduct, ancient, reopened.... 64
Aqueduct, suspended, a..... 210
Aqueduct, Washington, arch..... *47
A quicksand section..... 421
Arctic voyage, remarkable..... 259
Arctic winter, the..... 127
Area, the, of Louisiana 290
Arid regions, the, investigation. 136
Arms, safety, self-cocking..... *294
Arsenic in caustic soda..... 374
Artistic mantelpiece..... *375
Asia, the heart of 169
Asphalte..... 121
Assassination, new method of ... 256
Assaying ores..... (14) 26
Assay, volumetric, bullion, etc. . *55
Astronomer royal, the new..... *242
Atlanta exhibition, the *343
Atlanta exhibition, woods, etc. at 323
Atlanta exposition, the..... 257
Atmospheric pressure 309
Automatic freight car brakes ... 420
Autumn leaves, to preserve.... (6) 346
Awards, Amer., at Geog. Exhib.. 241
Aztec calendar stone, a..... 19

B

Balance, simple, a..... *99
Balloon experiment, a..... 216
Balloon experiment, another. ... 170
Balloon, stray, a..... 50
Balloons, soap bubble..... 249
Ballot box, new..... 3
Bahama banks, the..... 194
Bamboo, great, of Japan..... 169
Band saw machine, new..... *67
Band saw, to solder..... (23) 26
Barb fence question, the..... 137
Barcelona, Citadel Park of. . . 407
Basket willows..... 168
Bath box for photo. purposes.... *99
Battery carbon..... 227
Battery, compact, a..... *150
Battery, Faure, and electric light 258
Battery, improved, an..... 198
Battery, Maische's..... *68
Battery, portable, new..... *182
Beacon light, Absecom..... 232
Beans..... 98
Bed, invalid, Davis *274
Bed, spring, improved *131
Beer, braga..... 296
Beer, the Pasteurization of..... 98
Bees, are they a nuisance ?..... 405
Bees, intoxicated..... 409
Beetle, carpet, the, spread of.... *33
Beetles as a test of wool..... 40
Bell telephone, antecedents of.. *83
Bell telephone decision..... 164
Bells on sheep..... 106
Bells, signal, for Eddystone..... 127
Belt, large 17
Bending machine for iron, etc... *98
Benedict, Charles 357
Beveling machine, plate glass....*310
Binding, cheap, for Sci. Am..... 65
Binoxide of hydrogen 23
Bird parasites, eggs of..... *183
Bird, reed, shooting in Delaware. 265
Birds, acorn-storing..... 342
Birds, passenger..... 216
Blacking, vegetable..... 242
Blast furnaces..... 88
Blast, large, a 149
Blasting, casualties in..... 288
Blasting without drilling..... 178
Board of health rules, plumber... 293
Boat, electric, the..... *23
Boat, velocipede, in Boston.....*263
Bog, a, draining..... 232
Boiler, a, explosion of, Pottsville *34
Boiler experiment, interesting.. 21
Boiler explosion, cylinder..... *20
Boiler explosion, experimental ..*403
Boiler explosion, Gaffney 64
Boiler explosion in Ohio..... *384
Boiler explosion, Mr. Lawson's.. 97
Boiler explosion notes..... 2
Boiler explosion on a dry dock...*209
Boiler explosion, Watertown....*162
Boiler heads, cast iron, flat.... 69
Boiler, button-set riveting for... 96
Boiler notes, steam..... 390
Boilers, cast iron flat heads for.. 389
Bones, to bleach..... (2) 862
Bone, transplantation of..... 147
Book rest, improved..... *326
Boot and shoe machine patents . 160
Boot and shoe making..... 223, 228
Botanical notes..... 280
Bottle, novel, a..... *100
Bottle wrapper, novel *371
Bottles, to cut off..... (3) 315
Bows and arrows, modern..... 101
Braga beer..... 296
Brain, the, electrotype of..... 53
Brakemen, mortality of..... 67
Bran, charred, for preserv. fruit, 162
Brass and bronze, casting, etc... 328
Brass, burnished, some things in..*391
Brass dip..... (14) 362
Brass, naval..... 72
Bray, the, of Mexican donkey... 54
Breakfast set of Sevres porcelain*279
Breastplate, steel..... 296
Bricks, variability of the..... 344
Bridge columns, full-sized, test.. 161
Bridge, East River, the..... 358
Bridge, Suspension, Niagara..... *31
Bridges, railway, vibrations of... 401
Bridging Lake Pontchartrain.... 338
Brine, natural, pipe line for..... 180
British patent laws..... 2
British Science Association..... 201
Bromide of potassium, lead in.... 389
Brooks' periodic comet..... 341
Brunner, Burroughs Price..... 38
Buffalo skins, new use for..... 307
Buggies, steam..... 340
Buildings, high, in New York.... 181
Bulk, the, of a ton of coal..... 373
Bullet, Presidential, the..... 244
Bullion, alloys, etc., vol. assay of *55
Buoy, illuminated, an..... 164
Burns, the treatment of..... 376
Butter coloring 112
Butter, good, how to tell 21
Buttons, improvement in 54

C

Cadaveric alkaloids..... 36
Calcium..... 312
California enterprise, a..... 360
California silk exhibits..... 200
Calves, westward traffic in..... 164
Can a patent be sold for debt?... 368
Canal, Panama, the..... 147, 309
Canal work at Panama..... 169
Canceling stamp, improved..... *67
Candles, how to make..... *383, 386
Candy, sweet-flag 361
Cane juice, extractor for..... 326
Canning, pioneer..... 97
Cannon, Lyman-Hackett..... 304
Canoe building, etc., progress in. 181
Can soldering machine, a..... 295
Carbolic powder..... 375
Carbon electrics..... 163
Carbon paper..... (2) 107
Carbon transparencies..... 408
Carbonic acid, poisoning by..... 280
Car cable in Chicago..... 170
Car couplers, self-acting..... 372
Car coupling, new..... *262
Car coupling, safety..... 416
Carelessness, cost of..... 213
Car, freight, improved..... *166
Carpet beetle, the, spread of..... *33
Carrier pigeons as doctor's mess. 329
Car starter, improved..... *86
Car truck, improved..... *22
Car wheels, casting..... *163
Cars, cattle, improvement of..... 373
Case hardening small articles.(18) 26
Casting and moulding brass, etc. 328
Cast iron boiler heads..... *65
Castor oil, external use of 338
Castor oil, gas from..... 117
Casualties in blasting 288
Catamaran, steam passenger, a... 105
Cattle, American, infection of.... 372
Cattle car competition..... 288
Cattle cars, improvement of..... 373
Cattle ringer, novel..... *18
Celluloid, manufacture of..... 48
Cement..... (14) 315
Cement and concrete, expans. of 249
Cement and plaster, painting of . 309
Cement, strong and handy, a..... 210
Cements..... (13) 315
Census, a, of the rocks..... 39
Census of Great Britain..... 133
Centenary, Stephenson..... 17
Cephalopoda, peculiarities of the *167
Chair, easily-made, a..... *210
Chair, window, improved *277
Chart rack, novel..... *4
Chemical action..... 32
Chemical paradoxes..... 42
Chesapeake Bay lighthouse, new 67
Chess playing, memory in..... 378
Chicago waterworks *399
Chicken hatching by electricity.. 342
Chilcat meteor, the..... 89
Children's teeth, a study of..... 176
Chinese scroll, notable..... 345
Chlorine, preparing..... 261
Cholera, sulphur fumes for..... 248
Cicada, periodical, the..... 21
Cider, good, how to make..... *133
Cider, lead in 390
Citadel Park of Barcelona..... 407
Citrate of magnesia, to make.(14) 346
City, manufacturing, model..... 52
Clock-dial mechanism, electric.. *295
Cloth cutting machine, new..... *242
Clothmaking, fast..... 327
Cloth register, novel..... *182
Coal, the bulk of a ton..... 373
Coal, the formation of..... 423
Coal, the nature of..... 310
Coast survey, the..... 161
Codfishing with nets..... 25
Coffee, action of, on the stomach. 376
Coffee and sugar..... 120
Coffee, Liberian..... 103
Cold air machine, Presidential... 84
Cold storage..... 417
Colors, angular distance of..... 272
Columbia, new..... 259
Comet, another, discovered..... 81
Comet, another new 263
Comet (C), retreating, the..... 161
Comet, division of the, doubted.. 63
Comet, Enck's..... 244
Comet, great, now in sight..... 17
Comet, great, of 1881..... 32
Comet, great, of 1881, views of.... *69
Comet, new, the..... 104
Comet, periodic, Brooks'..... 341
Comet, Schaeberle's..... 129
Comet, the separation of..... 48
Comet, the Brooks-Denning..... 293
Comet 2, 1881, early obs. of..... 69
Comets, more..... 225
Comets, tails of..... 112
Commander Cheyne's lectures... 352
Commissioner of patents, resign. 369
Compressed air for elevated R. R. 304
Compressed air locomotive..... 3?1
Compression riveter, portable....*322
Compulsory alimentation 415
Comstock mines, temperature in. 164
Condensed milk..... *99
Condor, the..... *297
Conductor's printing office, a..... 82
Congress, electrical, in Paris..... 363
Congress, inventors, an..... 37
Consumption, is it contagious?.. 128
Conventionality in designing..... 304
Convention, fire engineer's..... 227
Convention, summer..... 18
Cook, Ransom..... 25
Copper, estimation of, note on... 357
Copper in sub-nit, of bismuth.... 304
Copper, iridescent 70
Copper ores, electro assay of..... *99
Copying paper..... (18) 208
Copying process, stencil..... *65
Coral reefs, how built..... *151
Coral worm, great..... *151
Cord lightener, improved..... *262
Cork extractor, novel..... *67
Correction, a..... 21
Corwin's, the, collections..... 370
Cotton and its future..... *207, 211
Cotton fair, Atlanta..... 65
Cotton fiber, structure of..... 305
Cotton growing..... 329
Cotton harvesting, machines.*207, 211
Cotton industry, the, poss. of..... 336
Cotton manufacture, the 128
Cotton milling in the South..... 360
Cotton plant, root of the 199
Cotton plant, the, and its fiber.. *273
Cotton seed oil, manufacture of. 25
Cotton spindles in Fall River 375
Cotton stalk cutter and puller....*342
Cotton, statistics of..... 216
Counting, automatic, of letters .. 130
Cow's milk, analysis of..... 36
Crater, the, of Kilanea..... 195
Cremating furnace, garbage..... *1
Criminals, cerebrology of..... 36
Crystallization, experiment in.... 321
Cultivator, a tea, wanted..... 256
Cunard liner Servia, the new..... 138
Curious freak of a dog 389
Curse of poor printing, the..... 72
Cutaneous diseases, remedy for. 170
Cut-off engine, new *294
Cut-off for electric lamps..... *226

D

Dairy scheme, a..... 21
Dam, Chanoine, at Pittsburg..... 249
Damper, improved..... *355
Dangers of the electric light..... 291
Dassori's safeguard 360
Day's work, good, on a railroad.. 118
Deadly fly, the, in Texas..... 309
Deaf mutes, teaching..... 274
Decay of the stomach cured..... 402
Decisions, patent 404
Decisions, trade mark..... 292
Decorations, panel, Eaton Hall... *39
Deep sea soundings..... 119
Defense, naval and coast..... 401
Demagnetizing watches..... *134
Dental alloy amalgam, new..... 200
Dental Association, American.... 66
Depolarization of electrodes.....*407
Designing, conventionality in.... 804
Desks, school, improvements in..*178
Destroyer, torpedo boat..... 253
Development, retarded, case of.. 116
Device for operating tool rests..*291
Deville, Sainte-Claire, Professor. 115
Diamonds, etc., of South Africa.. 328
Diamonds, paste..... 101
Diatoms..... 89
Dinner bucket, improved..... *322
Diphtheria, lemon juice in..... 53, 163
Diphtheria, salt in 401
Diphtheria, tartaric acid in..... 53
Diphtheria, vegetable origin of.. 329
Discoveries, Dr. Heaths', in S. A. 193
Disease, prevention of..... 181
Diseases, pulmonary, ammonia.. 375
Disinfectant, cheap..... 296
Dividers and callipers, improved *67
Diving apparatus, new..... *278
Division of the comet doubted.. 63
Dog collar, costly, a..... 194
Dogs, sheep-killing, trap for..... 105
Doolittle, Sylvester..... 292
Door latch, improved..... *130
Doors, hatchway, improved..... *295
Dotterel, ill-fated, the..... 105
Double driving tricycle *372
Dragon flies, swarms of..... 119
Dragons in their prime..... 136
Drainage system, Florida..... 69
Draught appliance for stoves....*291
Drawing pen, improved..... *259
Dredger, largest in the world. ... 138
Drifting half a year..... 19
Drilling, fine..... 307
Drop press, new..... *86
Drumming log, the..... *361
Drying agent, remarkable..... 4
Drying cylinder, steam, explos... *88
Dry season, the..... 261
Duck, elder, farms and feathers. 279
Ducks, eider, the..... *247
Duration of life, the..... 392
Dynamic-electricity..... 55
Dynamo-electric machine, new..*246
Dynamometer, optical..... *114
Dynamo, new, steam, Edison's..*367
Dyestuffs, artificial indigo in..... 165
Dynamic electricity..... *407

E

Earthquake record, Japanese.... 201
Earth stars..... *119
Earthworms and anthrax..... 57
East River Bridge, the..... 358
Ebony cabinet 423
Eddystone lighthouse, comp. of.. 9
Edison's new steam dynamo.....*367
Eggs of bird parasites..... *183
Eggs, preservation of..... 3
Egyptian relics, great find of..... 169
Elder duck farms and feathers... 279
Elder ducks, the..... *247
Eight thousand ton steamer..... 371
Electric clock-dial mechanism...*295
Electric energy, storage of..... 53
Electric exhibition, Am. success. 289
Electric exhibition, Paris 129
Electric generator, improved....*166
Electric lamp, portable..... 245
Electric light, dangers of the.... 291
Electric light exhibition, Paris.. 193
Electric light for deep water..... 5
Electric light for the stomach....*281
Electric light, second battery (16) 362
Electric light in Barcelona..... 370
Electric light in theaters..... 406
Electric light, naval experiment. 210
Electric light patents..... 19
Electric light vs. gas..... 406
Electric lighting, an Am. triumph 389
Electric lighting, wind power for 245
Electric rail, first in Gt. Britain. 259
Electric railways, advantages of 19
Electric shock, a fatal..... 153
Electrical conduct, of moist air.. 353
Electrical congress in Paris..... 353
Electrical exhibition at Paris*175, 377
Electrical exhib. in London..... 325
Electrical exhib., international..*159
Electrical exhibition, Paris..... 81
Electrical induction by stress.... *6
Electrical magic..... *327
Electrical measures..... 295
Electrical steel melting..... 357
Electricity and ballooning..... 249
Electricity as a mode of motion.. 7
Electricity by magnet. induc. *351, 356
Electricity, constant sources of.. 272
Electricity, fired by..... 131
Electricity, growing flowers by... 291
Electricity, hatching by..... 342
Electricity, power by in mining.. 180
Electricity, stored up..... *23
Electricity, storing up..... 17
Electrodes, depolarization of.....*407
Electro-magnet, a large..... 122
Electro-massage..... *54
Electro-metallurgy..... 241
Elevated railroad..... 7
Elevated railway statistics, N. Y. 147
Elevator, largest in the world.... 277
Elevators in New York..... 181
Elias magneto-elect. machine.... *403
Emery, to wash..... (19) 26
Energy, expend. incand. light.... 311
Engine cut-off, new..... *294
Engine, hoisting, without drums 214
Engine, non-cond. vs. cond. 266
Engine, stationary, beam..... *415
Engineering, Washington Monu. 294
Engineering exhibition..... 356
Engineering inventions..4, 58, 84, 105, 114, 154, 183, 232, 296, 307, 326, 343, 354, 376, 406
Engineering projects, great, some 384
Engineers, American Society of. 144
Engineer's inspector, the..... 10
Engines, fire, self-propelling..... 340
Engines, steam, compound..... 257
Engines, steam, comp. value of.. 8
England, protection in..... 263
Engravers, wood, girls as..... 170
Enterprise, American..... 154
Enterprise, California, a..... 360
Eruption of Mauna Loa..... 106
Eruption of Mount Lapwai..... 227
Estimation of nickel, in sulphide 261
Etching steel..... (7) 91
Ether, solidification of..... 98
Europe, to reach, in five days.... 390
Evolution, Prof. Winchell on.... 102
Ewe, prolific, a..... 296
Exhibition at Atlanta, Ga..... *343
Exhibition, Atlanta, woods, at.. 323
Exhibition, electrical, internat..*159
Exhibition, electric, Paris 129
Exhibition in Orizaba, Mexico.... 17
Exhibition, int., elect. at Paris . 377
Exhibition notes, Am. Institute.. 306
Exhibition, Paris, accidents at.. 320
Exhibition, proposed in Boston.. 305
Exhibition, semi-centennial..*271, 276
Exhibitions, industrial, great.... 192
Exhibits at Amer. Institute..*271, 276
Exhilarating substance, new..... 51
Expansion voltameter *22
Expansion of water by heat..... 417
Experiments, Govt. test, mach.. 337
Explosion, boiler, experimental. *403
Explosion, boiler, in Ohio..... *384

© 1881 SCIENTIFIC AMERICAN, INC

Explosion, boiler, Mr. Lawson's.. 97
Explosion, boiler, on a dry dock.*209
Explosion, boiler, Watertown....*162
Explosion caused by lightning... 161
Explosion, dust, from lightning.. 169
Explosion, dust, in Ehret's brew'y*113
Explosion of a boiler in Pottsville *34
Explosion of a cylinder boiler... *20
Explosion, strange, a..... 113
Explosion, torpedo, fatal..... 198
Extraction of sulphur from ore . 311
Extract meat, Liebig's mf'y...*79, 84

F

Fabrics, woven, oil painting on.. 314
Fairbairn grate bar *358
Fair, mechanics', in Boston..... 97
Families, prolific and long-lived. 214
Fans, Japanese, as an audiphone. 47
Fans in a hospital..... 245
Farming by telephone..... 184
Farms, eider duck..... 279
Fast, Dr. Griscom's..... 64
Fast locomotive, a..... 341
Fast trains, West and South..... 340
Faure battery, the.....*23, 118
Faure battery and electric light.. 258
Feathers, eider duck 279
Feed water regulator, improved.. *18
Fence, improved.....*147
Fence posts, to preserve..... (26) 26
Fences, iron, improvement in....*118
Fenian infernal machines *179
Fever, yellow, reward, antidote.. 279
Fevers, intermittent, remedy for 280
Fiber, cotton, structure of 305
Filter, improved.....*147
Fire caused by lightning..... 161
Fire engineers' convention..... 227
Fire engines, self-propelling... 340
Fire flies, spectra of..... 184
Fire from milk pans 164
Fire, Michigan, incidents of the .. 265
Fire, Michigan, the..... 244
Fire risk from spontaneous comb. 217
Fire risks and tall buildings 295
Fires, field and forest..... 208
Fires, great, in Michigan.....*.... 229
Fires in New Jersey swamps..... 325
Fires in N. Y. swamps..... 304
Firearm manufacture.....*148, 148
Firework formulæ..... 42
First elec. rail. in Gt. Britain. ... 259
Fish hawk's nest in channel buoy 164
Fish plagues in Gulf of Mexico... 40
Fish, destruction, by torpedoes.. 214
Fish, sleeping *231
Fish, sun, the great.....*361
Fisheries, U.S., of the great lakes 314
Fishes, worms in..... 247
Fishing fish, the..... 160
Fishing wheel, a..... 150
Flagstones, large..... 28
Flat heads, cast iron, for boilers. 389
Floating, easy, secret of *101
Flood Rock, N.Y. city, removal of 197
Floors, sunken..... 121
Florida, alligator hunting in 279
Flower stand, improved *210
Flowers, growing, by electricity.. 291
Flowers, preservation of..... 87
Fly, deadly, a.....*196
Fly, deadly, the, in Texas..... 309
Flying machine, electric.....*195
Flying squirrel, the.....*409
Fontaine locomotive, efficiency. 341
Fontaine locomotive, the.288, 336, 340
Food and drugs, examination of. 72
Food for infants 102
Foreign commerce, our..... 421
Forests, pine, extensive 367
Forests, spontaneous..... 217
Fouling in iron ships 90
Freak, curious, of a dog..... 389
Freight car, improved *166
French population in New York. 132
Frogs and frog hunting, Mich.... 197
Fruit, fresh, transportation of... 69
Fruit picker, novel..... 102
Fruit press, new.....*146
Fulminating compounds..... 48
Fulton, Robert, statue to..... 20
Fungus trade, New Zealand..... 297
Furnace, cremating, garbage.... *1
Furnaces, steam boiler, imp. in.. *5
Fusibility and fusing point..... 248

G

Gaffney boiler explosion..... 64
Galvanometer, new.....*354
Galvanization of engine piston.. 97
Gamgee's zeromotor.....8, 33
Garbage cremating furnace..... *1
Gardening railway..... 248
Garfield's (Mr.) youth, lesson of.. 240
Garfield's (Pres.) fatal wound ... 224
Gas engines, Otto, at Paris..... 390
Gas for whooping cough..... 405
Gas from castor oil 117
Gas, lighting by electricity..... *38
Gas, natural, in iron works 216
Gas purification by apatite 376
Gastroscope, the *281
Gelatine emulsion 216
Gelatine emulsion making..... 89
Gelatine, nutritive value of..... 408
Gems, North Carolina..... 360
Generator, electric, improved....*166
Geographical Congress, the 231
Germs, prophylactic inoculation. 215
Gilding enameled surfaces....(17) 26
Glass, a new variety of..... 390
Glass, to cut .....(1) 107
Glass, tortoise-shell..... 178
Glass, toughened 54
Glass tubes, joining together..... 40
Glass, water 16
Glove fastener, new..... *50
Glove, husking, new.....*374
Glucose, a new source of..... 415
Glycerin..... 70
Goggles, wire, snow blindness.... 154
Gold and silver in 1881 416
Gold in New York..... 277
Gold mining in Georgia..... 180
Gold, process for extraction of... 233
Gold work and jewelry, Amer.... 344
Gouramt, the 177
Governor, improved.....*278
Graduating apparatus, new..... *258
Grain crop, its com. importance.*303
Grain harvests of 1881 165
Grain storage, New York..... 23
Grasshoppers in Turkey..... 119
Grate bar, Fairbairn *358
Great Britain, census of..... 133
Great Eastern, the..... 344
Griscom's (Dr.) fast 64
Ground glass, imitation..... 89
Guacharo, or fat bird, the.....*135
Guillotine, mediæval..... 294
Guillotine, origin of the..... 392
Gun, another, bring out..... 95
Gun cotton, compressed 58
Gun stock, adjustable, new..... *66
Gun stock, cushioned, improved.*342
Gutta percha, peculiar property. 164

H

Halls, ventilation of..... 96
Hatching by electricity..... 342
Hatchway doors, improved.....*295
Hay drying by artificial means... 199
Hay-fork, horse, improved.....*163
Hay rick, sheltering..... *87
Headache, nervous..... 82
Health association, American... 402
Hearing, the sense of 215
Heat, distribution of in N. Y ....* 3 9
Heat, expansion of water by..... 417
Heat of the sun, the great 162
Heat, retention of by the earth... 129
Heat, storage of..... 192
Heat, subterranean..... 196
Heat, sun storms, etc..... 224
Heater and filter, lime-extract..*227
Heating effects due to compress. 72
Hectograph, improved..... 116
Hilo escapes the lava flow..... 262
Himilayas, elevation of the..... 283
Hinge, spring, improved.....*50
H. M. S. Bacchante, steer. app. for*131
Hobbs, John L..... 357
Hoisting apparatus, improved... *38
Hoisting engine without drums . 214
Holy well at Mecca..... 241
Honey, spurious, distinguishing. 102
Hook, detaching and lock.....*342
Hornets, how to come it over.... 106
Horse collars, improvement in... *4
Horse, frightened, don't whip a.. 21
Horse, new species of 343
Horse, supposed new species of.. 119
Horses, kind treatment of 279
Hotel large, moving of a..... 305
How to make candles.....*388, 386
Hudson, William S..... 97
Hunting alligators in Florida.... 279
Hunting in Greenwood..... 185
Husking glove, new..... *374
Hydraulic mining in Califronia .. 51
Hydraulic mining, injunction.... 361
Hydraulic rams, air press. on.... 354

I

Ice, antarctic..... 233
Icebergs, pursuit, etc., of..... .. 24
Improved life-raft.....*422
Inch an, one million lines to..... 355
Indigo, artificial..... 56
Indigo, artificial, in dye stuffs.... 165
Induction, balance, new use for. 66
Induction currents, appl. for, *351, 356
Industrial art instruction..... 184
Industrial exhibition, Mexican... 144
Industrial exhibitions, great..... 192
Industrial mortality..... 296
Industrial progress.....*271, 276
Industries, American, *117, *148, *255, *264, *271, *276, *383, 386
Industries, the, of New York..... 80
Industry, cotton, the, poss. of.... 336
Industry, magnesia, the..... 282
Infants, food for..... 102
Infernal machines, Fenian.....*179
Inheritance..... 151
Ink for rubber stamps.....(3) 91
Ink, scarlet.....(3) 346
Ink stains, to remove..... 217
Insanity, is it increasing?..... 321
Insects, muscular power of.....*370
Inspection, steamboat..... 369
Inspector, engineers, the..... 10
Instantaneous photography..... 194
Instinct or reason ?..... 161
Intermittent fevers, remedy for. 283
Int. exhib., etc., elect. at Paris.. 377
Intoxicated bees..... 409
Invalid bed, Davis.....*274
Invention, an, called for..... 21
Invention, an opportunity for. 207, 211
Invention, field for, a..... 240
Inventions..... 106, 308
Inventions, agricultural..8, 51, 98, 153, 154, 229, 282, 309, 344, 378
Inventions, engineering..4, 58, 84, 103, 114, 154, 183, 232, 296, 301, 326, 343, 354, 376, 406
Inventions, mechanical..18, 50, 73, 88, 104, 130, 166, 167, 181, 216, 226, 261, 290, 311, 322, 341, 374, 393, 403
Inventions, miscellaneous..3, 54, 69, 100, 118, 138, 170, 180, 233, 242, 266, 280, 292, 312, 325, 357, 371, 388, 409
Inventions, new..5, 25, 57, 102, 114, 133, 146, 178, 198, 214, 231, 243, 258, 278, 291, 310, 325, 345, 359, 377, 391
Inventions, railroad, wanted..... 321
Inventions, recent..6, 53, 66, 90, 105, 117, 150, 185, 201, 210, 230, 246, 262, 274, 307, 339, 355, 373, 408, 418, 419
Inventor's congress, an 37
Investments, patents as..... 400
Iridium..... 24
Iron and steel industry..... 154
Iron fences, improvement in.....*118
Iron from black sand..... 408
Iron, tinned, preparation of..... 68
Iron, soldering, improved 371
Itch in horses.....(4) 315
Ivory, to remove stains from ..(4) 91

J

Japanese earthquake record..... 201
Japanese fan as an audiphone... 47
Japanese lacquer and paper..... 184
Japan for iron.....(17) 298
Japanning and japans..... 145
Javelle water, to make.....(3) 362
Jeanette relief expedition..... 3
Jetty lights..... 106
Jewelry, patntd. improvements in*243
Jewels, imitation..... 138
Jointed pitch-board for squares..*259

K

Kaleidoscope, improved.....*290
Keely motor, exhib'tns, another. 293
Kerosene, non-explosive..... 112
Kid leather, how prepared.....*354
Knife, pocket, improved.....*326
Koumiss..... 144

L

Labor statistics..... 416
Lady Franklin Bay expedition... 53
Lady Franklin Bay colony 19
Lake, great, ancient, in the west. 375
Lake Pontchartrain, bridging.... 338
Lakes, great, U.S., fisheries of the 314
Lamp, safety, anew..... 119
Lamp, suspended, new reflctr. for *54
Lamps, under-water..... 245
Land-owner, largest..... 200
Land ship at Elm, Switzerland ... 292
Lasting machines, new.....*63
Latch, door, improved.....*130
Lathes, remarkable 403
Lathes, tool rests of.....*291
Launch, steam, with novel engine 152
Launches, steam, trial of in Eng. 181
Lava flow, Hilo escapes the..... 262
Laws, patent, the..... 68
Laws, State, affecting patents.... 16
Laws, the, of property..... 68
Leather, alligator..... 24
Leather, kid, how prepared.....*354
Lead in bromide of potassium... 389
Lead in cider and vinegar..... 390
Lead pencil marks, to fix.....(24) 26
Lead, to protect 133
Lectures, Commander Cheyne's.. 352
Leech farm, a..... 90
Lemon juice in diphtheria..... 58
Letters, aut., counting of..... 130
Levee building on the Mississ'pi. 106
Liebig's extract of meat.....*79, 84
Life, expectancy of..... 249
Life-raft, improved.....*422
Life-saving lesson in physics.....*65
Life, tenure of..... 183
Life, the duration of..... 392
Life, underground, in England.. 170
Light and heat, dist. of in N. Y.. 319
Light, decomposition of..... 73
Light, distribution of in N. Y ...*319
Light, electric, for the stomach..*281
Light, electric, in Barcelona..... 370
Light, electric, in theaters 406
Light, electric, vs. gas..... 406
Light of the stars, the..... 314
Light, velocity of..... 21
Lighthouse service, the..... 272
Lightning, effects of on trees.... 296
Lightning, local..... 147
Lightning, theory of..... 280
Lightning, a stroke of..... 244
Lightning, protection from..... 88
Lightning, storage of, proposed.. 390
Lilies, yellow, acres of 185
Lime as a preservative..... 378
Lime, influence of on soils..... 249
Loan exhibition, Ohio..... 3
Lock and rever. latch comb.....*355
Lock, permutation, improved ...*182
Locking rail. cars in England.... 261
Locomotive, a, water fuel on..... 252
Locomotive, central power..*239, 345
Locomotive, comp. air on El. R.R 321
Locomotive, fast, a..... 341
Locomotive, Fontaine, efficiency 341
Locomotive, Fontaine, the..*230, 288, 336, 340
Locomotive, naphtha, a..... 116
Locomotive, road..... 98
Locomotives, American..... 138
Locomotives, large, for the West 105
Locomotives, speed of..... 56
Longevity in Europe..... 212
Longevity of the ancients..... 308
Long tunnels, ventilation of..... 420
Louisiana, area of..... 290
Lubricants..... 41
Lubricator, improved.....*70
Lumber industry of Puget Sound 154
Lumber, terra cotta..... 345
Luminous paint 368
Luminous signals, intermittent.. 73
Lyman-Hackett cannon..... 304

M

Machines to destroy..... 180
Madge, the, and her victories..... 320
Magazines for coal stoves..... *98
Magic, electrical..... *327
Magic wheel, the.....*338
Magnesia industry, the 282
Magnetic sep. of iron sand..... 2
Magnetism, curious exper., in.... 134
Magnetism, infl. on elec. currents, 33
Magneto-electrical machine.....*403
Magnets..... 249
Magnets, strong..... 210
Mammoth Cave, temperature of. 225
Manifold paper.....(18) 298
Mantelpiece, artistic.....*375
Manufacturing city, model..... 52
Manufacture of wall paper..... *418
Manure, ammoniacal, improved.. 184
Marco Polo, statue of, in Venice 258
Marl, New Jersey..... 185
Mason, Josiah, Sir..... 25
Mat, an ancient..... 103
Measures, electrical..... 295
Meat, fresh, how handled 217
Meat, Liebeg's extract of.....*79, 84
Meat, to preserve.....(9) 346
Mechanical inventions..18, 50, 73, 88, 104, 166, 167, 181, 194, 216, 226, 261, 290, 311, 322, 341, 374, 393, 403
Mechanical movement, new..... *50
Mechanics, amateur.....*391
Mechanics, educated..... 82
Mechanics' fair in Boston, open'g 209
Medals, etc., reproduction of..... 305
Mediævalgulllotine..... 294
Mediæval guillotine, a..... 392
Medical Congress in London..... 129
Memory in chess playing..... 378
Men, old, as scientists..... 134
Metal, ajax..... 213
Metallurgy of nickel..... 208
Metals, impurities on the prop. of 40
Metals in solidifying..... 38
Metals, poisonous effects of..... 417
Meteor, Chilcat, the..... 89
Meteor, Minnesota, a..... 116
Meteorite, a fall of, in England.. 389
Meteorite, grass fired by a..... 241
Meteorological station, portable*115
Meteors, luminous.....266, 345
Mica..... 257
Mica and asbestos..... 21
Michigan fire, incidents of the.... 265
Michigan fire, the..... 244
Microphone, phosphorus, a..... 90
Microphone, the, in observatories 272
Microscopists, Am. Society of.... 256
Mildew, to remove.....(2) 59
Military ants of the Amazon..... 314
Militia, a, for the sea..... 128
Milk, condensed..... *99
Milk, doubtful, boil..... 217
Milkweed as an insect intoxicant 280
Millers, live..... 393
Milling machinery, exhibit of..... 3
Minerals, beautiful, discov. of.. 243
Mines, Alaskan..... 378
Mines of Tasmania..... 875
Mining, hydraulic, in California 72
Mining under fire and water. ... 129
Mirrors, parabolic, manufac. of.. 249
Miscellaneous inventions 423
Misinstruction, the acme of 352
Mississippi river, improvement.. 198
Mississippi, the, and tributaries. 215
Molecular attraction..... 291
Moles, how they aid agriculture.. *82
Monolith, large, a..... 88
Monumental granite, Nevada..... 263
Moon pictures, Harrison's..... 37
Mortality from snakes and tigers 376
Mortality, industrial..... .. 296
Mortality of brakemen..... 67
Mortising machine, Fiester's..... 262
Mosquitoes..... 106
Mother-of-pearl..... 84
Motor, novel, for fan blowers....*146
Motor, small, wanted..... 909
Moving of a large hotel..... 306
Muscular power of insects.....*370
Museum of Natural Hist., gift to 51
Muskrat musk..... 168
Myaisis in the Argentine Republic 199

N

Names of the States..... 323
Natural History Museum, N. Y.. 136
Natural history notes..... 120
Natural objects, delicate, cast,.. 184
Nature, the, of coal..... 310
Naval and coast defense 401
Naval and submarine engineer'g. 56
Navigation of the air..... 339
Nearsightedness in schools..... 201
Needles, manufacture of..... 163
Negatives, tissue, gelatine plates 41
Nevada monumental granite 263
New England Indust. Exhib..... 144
New England life two gener. ago 200
New inventions..... 120
New Jersey, Southern, sinking... 193
New York harbor, improvements 134
New Zealand fungus trade..... 297
Niagara suspension bridge. *31
Nickel, metallurgy of..... 208
Nickel plating..... 259, 297
Nickel plating, practical hints... 263
Nitro, safety..... 105
Nickel sulphide, estimation of... 261
Nicol prism, nature, etc., of..... *325
Nitrates in Nevada..... 72
Nitro-glycerine .....(25) 26
Noise, much, the source of..... 17
North Carolina gems..... 360
Northwest, survey of..... 263
Nutritive value of gelatine..... 408

O

Obituary:
Benedict, Charles..... 357
Brunner, Burroughs Price.... 38
Cook, Ransom..... 25
Deville, Saintré-Claire, Prof. 115
Doolittle, Sylvester..... 292
Hobbs, John L..... 357
Hudson, William S..... 97
Mason, Josiah, Sir..... 25
Poillon, Cornelius C..... 64
Roberts, W. Milnor..... 115
Sauvage, Frederic..... 292
Spencer, Charles A..... 278
Towle, Hamilton E..... 272
Observations, curious, on ants... 71
Ocean steamer, great, another... 402
Odd things about wrecks..... 323
Ohio, boiler explosion in.....*384
Ohio River, the.....*287
Oil, castor, external use of..... 338
Oil, cotton-seed, in cookery..... 153
Oil, striking, in Titusville..... 104
Oil, vegetation in..... 248
Oil of bitter almonds..... 120
Oil painting on woven fabrics.... 314
Oil well fittings, manuf. of...*255, 264
Oils, to extract from herbs.....(8) 91
One million lines to the inch..... 355
Operculums and eye stones..... *167
Optical dynamometer.....*114
Orange culture in Syria..... 244
Organic matter in meteors..... 420
Organ reed, new.....*307
Osprey, American, the home of.. *71
Otto gas engines at Paris..... 390
Our foreign commerce..... 421
Oxygen, absorption of 210
Oyster culture, steam vs. sails in. 160
Oyster notes..... 289
Oysters in New Orleans..... 277
Ozone at the electrical exhib..... 89

P

Painting of cement and plaster.. 309
Painting, oil, on woven fabrics.. 314
Paint, luminous..... 368
Paint, transparencies prod. by .. 314
Panama Canal, the..... 147, 184, 309
Panel decorations for Eaton Hall *39
Pants, attachment for.....*116
Paper making, Am. suprem..... 353
Paper pulp from wood..... 296
Paper trade, improvement in the 115
Papers, ultramarine..... 355
Papers, wall, manufacture of ...*335
Papier mache..... (1) 59
Paradoxes, chemical..... 42
Paris exhibition, accidents at.. 320
Paris electrical exhibition ...*185, 377
Paris opera, telephone at the.....*422
Park, Citadel, of Barcelona..... 407
Paste, strong..... (9) 91
Patent, a, can it be sold for debt. 363
Patent commissioner, resig. of... 369
Patent decisions.....20, 132, 137, 404
Patent decisions, recent..... 154
Patent laws, British..... 2
Patent laws, the..... 68
Patent Office, promotions in..... 193
Patent Office, recent changes in.. 129
Patent Office, the work at 256
Patents as investments..... 400
Patents, reform..... 27
Patents, electric light..... 19
Patents in Turkey and Siberia... 81
Patents, State laws affecting.... 16
Patents, the question of 137
Patterson, Carlisle-Pollock..... 144
Paupers and criminals..... 2
Paving stone, large, a..... 153
Peanuts..... 297
Pearl fishery, Ceylon..... 183
Pearl hunting in Tennessee ... 217
Pearl inlaying..... 81
Pens, quill..... 182
Perfumes, poisonous..... 374
Petroleum, distillation of..... 346
Petroleum, heating tires by..... 354
Petroleum, storage of..... 224
Petroleum springs, German..... 165
Phantasmascope, the.....*338
Pharaohs' serpent and sea snake 87
Phenomena, curious..... 7
Philological Society, American... 68
Phosphates, the, South Carolina. 169
Phosphorescent substances..... 53
Photo emulsion, improved..... 132
Photo substitute for glass..... 216
Photograph, large, a..... 371
Photographs, colored..... 132
Photographers' convention..... 144
Photographic discovery, Import.. 9
Photographic plates, substrata... 146
Photographic prints, colored..... 36
Photographic salon, French..... 57
Photographing the theaters..... 323
Photography in natural colors.... 25
Photography, instantaneous..... 194
Phylloxera, the, in France..... 215
Pick, improved.....*354
Pictures, moon, Harrisons'..... 37
Pictures, positive, on gelatino-chloride.....266, 345
Pigeon, patent, a..... 49
Pig iron breaker, Blake's.....*402
Pilgrim, the, look out for 193
Pillows and bolsters, impot in...*146
Pilocarpin, effects of on hair..... 404
Pine forests, extensive..... 367
Pin manufacture..... 40
Pin worms, to get rid of..... 8
Pipe line, new..... 181
Pipette, convenient, a..... 312
Pistols, toy, and lockjaw..... 80
Piston, steam engine, improved..*226
Pitch-board, jointed, for squares*259
Plague, a, among the violets..... 374
Plagues, fish, in Gulf of Mexico.. 40
Plant, cotton, the, and its fiber...*273
Plant, shoe black..... 217
Plaster, adhesive, elastic 24
Plate glass beveling machine.....*310
Plating, nickel..... 259
Plates, weldless ring, for boilers. 261
Plugs, cause of showing..... 373
Plumbers, N. Y., rules for..... 293
Plumbers, registration of..... 8
Pneumatic riveting machine *306
Pocket knife, improved.....*326
Poillon, Cornelius C..... 64
Point Barron signal station..... 358
Poison, Italian antidote..... 97
Poisonous effects of metals..... 417
Poisonous perfumes 374
Poisonous refreshments..... 48
Poisons and their antidotes..... 226
Polar observation..... 20
Population and territory..... 39
Porcelain factory, Sevres.....*103
Porcelain urn..... *7
Porcelain, Sevres, breakfast set .*279
Porcelain, to enamel.....(19) 298
Portable compression riveter....*322
Portraits, composite..... 90
Postage stamps..... 105
Postage stamps, how made..... 212
Postal business of the world..... 152
Potato bug catcher..... *150
Potatoes and their utilization.... 229
Pottery, Roman, ancient.....*188
Poueline..... 163
Powder, blasting, explosion..... 243
Powder, carbolic..... 375
Power, muscular, of insects.....*370
Prawn, common, and its parasite*151
Prehistoric man, another.. ... 93
President, removal of the..... 209
Printing office, a conductor's.... 82
Printing, poor, the curse of..... 72
Progress, industrial.....*271, 276
Projects, engineering, great..... 384
Protection in England..... 263
Pulley, safety, new *82
Pulmonary diseases, ammonia in 375
Pulque..... 120
Pumpkin seeds, crystal album. in 99
Pump, steam, double-acting.....*214
Pump, steam, double-plunger....*102
Punch, anvil, and shears comb.. *290
Punch, ticket, new.....*243
Purification, gas, by apatite..... 376
Putty holes cause of showing.... 373

Q

Quebracho wood..... 103
Quarter-second reduc., another.. 170
Quartz and marl as wood fillers.. 73
Quicksand section, a 421

R

Radiometer, new applic. of the.. 372
Raft, large, a..... 163
Raft, life, Hall's 21
Rail, fastening, new..... 115
Railroad accidents..... 284
Railroad accidents in June 98
Railroad employes, accidents to. 243
Railroad inventions wanted..... 321
Railroad, cutting a, along a cliff.. 38
Railway, a, on stumps..... 163
Railway bridges, vibration of..... 401
Railway cars in England, locking 261
Railway injured by earthquake... 272
Railway progress in 1880..... 121
Railway travel, risks of..... 80
Railway ventilating apparatus... 245
Rain, a, of spider webs..... 337
Rain in the United States..... 216
Rain of spider webs..... 389
Rain persuader, another *195
Rams, hydraulic, air pression on. 354
Rapid transit then and now..... 146
Redwood, durability of..... 405
Reed, organ, new 307
Reel and receptacle, ticket..... 358
Reel hand, for silk, need of a..... 97
Reel, twisting, improved.....*359
Reflector, new, for susp. lamp ... 54
Reform, patent..... 272
Refreshments, poisonous 48
Refrigerating machine 272
Refrigeration, artificial..... 56
Refuse, utilization of..... 373
Registering stamp, automatic....*179
Rejected cases, old, reviving..... 193
Relics, Egyptian, great find of.... 169
Researshes, antiquarian, in Mex. 39
Resistance coil for heavy currents.....(12) 29
Respiration, artificial 154
Ring trick, interesting..... 40
River, Ohio, the..... 287
Riveter, compression, portable..*232
Riveting, button set, for boilers.. 96
Riveting machine, pneumatic....*306
Road scraper, new..... *6
Robberies, car-safe, to prevent... 100
Roberts, W. Milnor..... 115
Rocket torpedo, a..... 151
Rocks, the, a census of..... 39
Rollers, three-high..... 200
Roofing, cheap .....(4) 346
Rubber, birch bark 100
Rubber, old, utilization of..... 170
Ruby Gravel Co.'s tunnel..... 259
Ruffed grouse, the..... 361
Ruggles, Daniel, letter of..... 37
Ruhmkorff's coil, modification of 345
Rust, to prevent on cutlery...(18) 332

S

Safes, bullion..... 132
Safety car coupling 416
Safety valves, boiler water..... 53
Salle d'asyle for New York..... 132
Salmon from the Arctic region... 342
Salt in diphtheria..... 401
Salt, manufacture of in the U.S. 176
Sand, black, iron from 408
Sand, resonant..... 182
Sanitary works and needs in N.Y. 325
Sardines, American..... 152
Sauvage, Frederic..... 292
Saw mills, band log, improved... *25
School desks, improvements in..*178
Schools, trade, in New York..... 193
Science association, American... 161
Science of value to all..... 153
Sciences, Academy of..... 353
Scien. Am. in the workshop..... 416
Scientific American Supplement. 416
Scientific American, the..... 147
Scientific explora. of the N.W.... 196
Screw and gear cutter.....*406
Screw propeller, history of the... 232
Scroll, Chinese, notable..... 345
Scylla and Charybdis, the new...*275
Sea lamprey, the *87
Sea serpents, sea weed 344
Sea sickness, a remedy for..... 100
Sea sickness, cure for..... 8
Sea sickness, treatment of..... 41
Seal catch, Newfoundland 21
Season, erratic, an..... 244
Seed, choice of in cotton grow.... 329
Seed germination, pressure on... 280
Seed, how it buries in ground..... 280
Seeds, testing..... 180
Selenium cell, the..... 163
Self-cocking arms, safety..... 294
Semi-centennial exhibition..*271, 276
Servia, the new Cunard liner..... 138
Servia, the ocean steamer..... 402
Severn tunnel, the..... 294
Sevres porcelain, breakfast set..*279
Sevres urn..... *199
Sevres vase..... *133
Sewing in a Boston pub. school.. 163
Sewing mach. works, Davis..*111, 117
Shad hatching, failure of..... 136
Shaft, deep, in Victoria..... 193
Shafting, hollow steel, in France 378
Sheathing, electrical, for ships... 212
Ship railway, Tehuantepec..... 233
Ships, iron, fouling in..... 90
Ships, to prevent from sinking... 212
Shoemaking machinery..... 342
Shot-case and distributor..... 312
Shutter fastener, improved.....*390
Shuttle-worker, improved.....*130
Signal bells for Eddystone..... 153
Signal corps, the year's work..... 322
Signals, luminous, intermittent.. 73
Silicon in steel rails..... 10
Silk exhibit, California..... 200
Silk mills in Philadelphia..... 105
Silver, determination of.....(15) 26
Silver, humid assay of..... 341
Sitting snake, a..... 71
Skins, buffalo, new use for..... 30,
Skull measurements..... 103
Slates, roofing..... 24, 26
Sleep, long, a..... 153
Slotting machine, improved.....* 70
Smallpox..... 367
Smoke nuisance, the, in Cincinn. 339
Smoke-preventing apparatus.... 241
Snake, sitting, a..... 71
Soil, artificial..... 4
Soldering iron, improved 371
Soldering machine, can, a..... 295
Solder wire.....(22) 26
Soles and turbots in N.Y. waters, 329
Solomon's Temple, restoring..... 344
Some things in burnished brass... 391
South America, diamonds, etc. of 328
Southern woods and ores..... 324
Southern woods, curious specim's 361
Speaking tube annunciator..... *82
Speech, transmitting..... 132
Spencer, Charles A..... 278
Spiders, a large collection of..... 168
Spiders obstruct the telegraph... 116
Spider webs, a rain of.....337, 989
Spindles, cotton, Fall River, Mass 375
Spinning attach. for sew. mach..*198
Sponges, fresh water..... 37
Spontaneous combustion..... 217
Spontaneous forests..... 217
Spotted amblystone..... 329
Spring bed, improved.....*131
Spring hinge, improved.....*50
Spruce beams, strength of..... 2
Spruce trees, destroyer of..... 281
Squid, giant, another..... 370
Squirrel, flying, the.....*409
Stamp, canceling, improved *67
Stamp, registering, automatic.... 179
Starch for shirts .....(27) 27
Stars, the light of the..... 314
States, the, names of..... 323
State taxation of patent articles 112
Stationary beam engine.....*415
Statue of Marco Polo (in Venice) 258
Steam boiler notes..49, 85, 104, 115, 145, 161, 193, 213, 241, 257, 277, 289, 325, 337, 357, 369, 390, 405
Steam boiler furnaces, imp. in...* 5
Steam engine notes 214
Steam launch with novel engine 152
Steam pipe, steamboat breaking.*149
Steam, superheated..... 293
Steam vs. sails in oyster culture. 160
Steam, water in..... 419
Steamboat inspection..... 369
Steamers in England and Canada 321
Steamer, mountain, a..... 132
Steamer, new, for Oregon..... 217
Steamer, new, Pictet..... 198
Steamer, ocean, great, another... 402
Steamer shafts, breaking of..... 405
Steamer, Western, new, elegant 144
Steamer, 8,000 ton, another..... 371
Steamship project, a new..... 390
Steel boiler flue, a collapse of..... 51
Steel melting electrical 357
Steel works, first in Colorado..... 129
Steel, hardening..... 106
Steel, temp. of least resist. in.... 71
Steel, weakening of by heat..... 136
Steering app. for H. M. S. Bachante *131
Stephenson, centenary..... 17
St. Gothard tunnel..... 3 20
St. Lawrence tunnel scheme..... 244
Stomach, decay of, cured..... 402
Stomach, the, electric light for..*281
Storage of heat..... 192
Storage of lightning, proposed.. 390
Storm, electric, at sea..... 200
Stormy petrel..... 134
Stove, acetate of soda, an..... 364
Stoves, coal, magazines for..... *98
Stoves, draught appliance for....*291
Strainer for tubs and basins..... *4
Strawberries, etc., by the barrel.. 40
Street railways, electric..... 64
Stress and strain..... 7
Strontianite..... 375
Sugar, action of, on the stomach. 376
Sugar mills, central, in Louisiana 4
Sugar process, Bonnefin's..... 377
Sugar refinery, large 274
Sulky, trotting, novel.....*374
Sulphate of ammonia from gas liquor..... 36
Sulphur, extraction of, from ore. 311
Sulphur fumes for cholera..... 248
Sulphuric acid, dangers of..... 90
Sulphurous acid..... 326
Sun fish, the great..... *361
Supplement, Scientific American 416
Sun storms, yellow light, etc..... 224
Survey of the Northwest..... 263
Suspension Bridge, Niagara..... *31
Sweet-flag candy..... 361
Swims, long, by men and animals 170
System, new, of waterworks.....*399

T

Tables, improvement in.....*258
Tannin, extraction of..... 3 29
Tape worm, the..... 409
Target, self-registering..... *196
Tasmania, the mines of..... 375
Teaching deaf mutes..... 274
Teaching, technical, in England.. 274
Tea cultivator wanted..... 256
Teeth, childrens', a study of..... 176
Tehuantepec ship railway..... 233
Telegraph, first in this country (6) 91
Telegraph, moral influence of.... 240
Telegraph, underground, Phila... 272
Telegraph line, underground ... 81
Telegraph monopoly, growth of.. 102
Telegraph wire jointer.....*310
Telegraph wires in sewers 49
Telegraph wires, underground... 406
Telegraphy, quick..... 19
Telephone at the Paris opera....*422
Telephone, Bell, antecedents of. '83
Telephone, sensibility of the..... 163
Telephone, the.....*260
Telephone, the, in Hungary..... 5
Telephone decision, Bell..... 164
Telephone decision, important.. 32
Telephone Exchange Association 198
Telephones, improvements in....*198
Telescope, a great..... 353
Temperature of Mammoth Cave. 225
Temple, Solomons', restoring ... 344
Terra cotta lumber 345
Testing a new magazine gun..... 419
Testing machine, government... 337
Texas, rapid progress in 200
Textile finishing machinery..... 177
The formation of coal..... 423
Thermometer, dichroic..... 176
The world's cotton trade..... 417
Thread, woolen..... 282
Three horses abreast..... 24
Ticket punch, new.....*245
Ticket reel and receptacle.....*358
Tightener, improved cord.....*262
Tile for illuminating purposes...*323
Tin in the Sierra Madra, Cal 67
Tinned iron, preparation of..... 68
Tin plate..... 68
Tin-plating processes..... 165
Tires, heating by petroleum..... 354
Tire tightener, new..... *51
Tobacco pipes, large collection.. 101
Ton of coal, a, the bulk of..... 373
Tool chest, novel..... 328
Tool, combination, improved....*227
Tool, handy, a.....*118
Tool, new, a.....*118
Tool rests, device for operating..*291
Tools, American art in 256
Tools, new.....*307
Torpedo boat destroyer 353
Torpedo explosion, fatal..... 198
Torpedo, rocket, a..... 131
Torpedo steamer Alarm..... 96
Torpedo versus fire..... 372
Towle, Hamilton E..... 272
Toy pistols and lockjaw..... 80
Trade mark decisions 292
Trade schools in New York..... 193
Trains, fast, West and South..... 340
Transfer paper..... (2) 107
Transparencies, carbon 408
Transparencies, produc. by paint 314
Treatment, the, of burns 376
Trees, spruce, destroyer of..... 282
Trichinæ in man..... 247
Trick, ring, interesting..... 40
Tricycle, double driving.....*312
Trotting sulky, novel.....*371
Trotting time, improvement in... 102
Truths, new, germinal value of.. 208
Tube, steel, for English channel. 293
Tubing, India-rubber, pres. of.... 50
Tunnel, Hudson River, test of.... 144
Tunnel, railway, through volcano 57
Tunnel, Ruby Gravel Co.'s..... 259
Tunnel, Severn, the 294
Tunnel, St. Gothard..... 320
Tunnel, St. Louis, ventilating 57
Turbines, 4 foot with 80. ft head.. 170
Turkey red on cotton..... 177
Turtle, a three hundred dollar...*119
Tweezers, improved.....*274
Twisting reel, improved.....*359

U

Ultra gaseous matter in Amer.... 36
Ultramarine papers..... 355
Umbrellas and pepper..... 416
Underground telegraph in Phila. 272
Underground telegraph wires.... 406
Undulatory current, Bell's..... 132
Urn, porcelain *7
Urn, Sevres..... *199
U. S. fisheries of the great lakes.. 314

V

Valve, automatic.....*146
Vanadium in caustic soda..... 374
Varnish for gelatine negatives... 54
Vase, Sevres.....*103
Vegetable origin of diphtheria... 349
Vegetation, effect of heat, on.... 248
Velocipede boat at Boston.....*263
Ventilating apparatus, railway... 245
Ventilation of halls..... 96
Ventilation of long tunnels..... 420
Vessels, wrecked, com. with..... 407
Vessels, wrecks of..... 323
Vibration of railway bridges..... 401
Vinegar, lead in..... 390
Violets, the, a plague among..... 374
Virus, attenuation of..... 176
Vise, improved.....*311
Visions in the clouds 291
Volcanic soils, fertility of..... 121
Volcano reported in Idaho..... 145
Voltameter, expansion..... *22

W

Wagon spring, improved..... *19
Wagons, steam..... 86
Wall papers, manufac. of...*335, *418
Washington aqueduct, arch..... *47
Washington monument mem..... 7
Wasps and their nests..... ....*313
Watches, demagnetizing.....*134
Watch, solar, De Combette's.....*196
Water, drinking, chem. exam. of. 3
Water, hot, for the heart..... 88
Water for fire purposes..... 344
Water from springs, bar. press... 249
Water fuel on a locomotive..

THE SCIENTIFIC AMERICAN.

$3.20 A YEAR (which includes the postage).

CIRCULATION BETWEEN 40,000 AND 50,000 COPIES EVERY WEEK.

TO ADVERTISERS.

THE SCIENTIFIC AMERICAN is printed once a week, and has a regular circulation of BETWEEN FORTY AND FIFTY THOUSAND COPIES every issue.

Advertisers in the SCIENTIFIC AMERICAN thus MAKE SURE of obtaining an *enormous circulation* among a most intelligent constituency, comprising the best customers in every part of the country. We estimate an average of twelve readers for every copy of the SCIENTIFIC AMERICAN printed. Advertisements are, therefore, brought before *half a million readers every week*. We anticipate a still larger circulation for 1882.

The prices of advertising are 75 cts. per agate line, for each insertion, on the inside of the paper, and one dollar per line, outside, or back page. Eight words on the average per line. A discount to quarterly and yearly advertisers. Address

MUNN & CO., PUBLISHERS,
37 Park Row, New York City.

The Scientific American, Export Edition.

THE SCIENTIFIC AMERICAN, EXPORT EDITION, is issued once a month, forming a complete and interesting monthly record of all Progress in Science and the Useful Arts throughout the World. Each number contains about *one hundred large quarto pages*, profusely illustrated, embracing:

(1.) Most of the plates and pages of the four preceding issues of THE SCIENTIFIC AMERICAN, with its *splendid engravings and valuable information*. Every number has from seventy-five to one hundred new engravings, showing the most recent improvements and advances in Science and the Industrial Arts.

(2.) Prices Current, Commercial, Trade, and Manufacturing Announcements of Leading Houses. In connection with these Announcements many of the Principal Articles of American Manufacture are exhibited to the eye of the reader by means of *splendid engravings*, the whole forming an elegantly printed Standard Catalogue, or Permanent Directory, of the Latest and Best American-made Goods, always under the eye of the foreign buyer, constantly influencing his preferences and purchases.

The Scientific American, Export Edition, has a large guaranteed circulation in all the principal Cities and Commercial Centers of the World. It is regularly received and filed for public examination by nearly all U. S. Consuls. Go into almost any American Consulate in any quarter of the globe, and the objects of greatest interest there to be found are the numbers of THE SCIENTIFIC AMERICAN. Foreign Merchants, Buyers of Goods, and others are always referred by the Consular Officials to the pages of this Journal, as containing the most recent announcements of the best reliable American Goods and Manufactures. THE SCIENTIFIC AMERICAN is also on file in the Principal Cafés, Club Rooms, and Exchanges. Among the regular subscribers for THE SCIENTIFIC AMERICAN, Export Edition, are leading Commercial Houses in foreign cities, Engineers, Directors of Works, Government Officials, and other prominent influential persons. Regular files of this paper are also carried on all the principal lines of STEAMSHIPS, foreign and coastwise, leaving the port of New York.

No Export publication sent from the United States reaches so many readers as THE SCIENTIFIC AMERICAN, Export Edition. It is by far the most splendid, satisfactory, and superior Export Journal ever brought before the public. Its pages are so arranged as to permit the publication, at very low prices, *of large and handsomely displayed advertisements of American Goods and Manufactures, with Engravings, which are always attractive to foreign purchasers.*

THE SCIENTIFIC AMERICAN, Export Edition, already enjoys the advertising patronage of many of the Great Manufacturing Establishments of this Country, who find it to be an UNRIVALED MEDIUM FOR SECURING NEW ORDERS AND EXTENDING TRADE.

If you wish to increase your business, try a handsome advertisement for one year, continuously, in THE SCIENTIFIC AMERICAN, Export Edition. Rates, $550 a year for a full page; half page, $300; quarter page, $175; one-eighth page, $100. Half-yearly rates in slightly increased proportion.

Published about the 20th of each month.

Single numbers of THE SCIENTIFIC AMERICAN, Export Edition, 50 cents. To be had at this office and at all the news stores. Subscriptions, *Five Dollars a year*; sent, postpaid, to all parts of the world.

MUNN & CO., PUBLISHERS,
37 PARK ROW, NEW YORK.

$5 A YEAR BY MAIL, POST-PAID. SINGLE COPIES 10 CENTS.

THE SCIENTIFIC AMERICAN SUPPLEMENT is a large and splendid periodical, issued every week. Each number contains sixteen quarto large pages, profusely illustrated with engravings. Fifty-two numbers a year. Uniform in size with THE SCIENTIFIC AMERICAN. THE SUPPLEMENT is, however, separately paged, distinctive in character, and forms a most valuable independent publication.

The contents of THE SCIENTIFIC AMERICAN SUPPLEMENT embrace a very wide range, covering the most recent and valuable papers by eminent writers in all the principal departments of Science and Useful Knowledge.

TERMS:—Scientific American Supplement, one year, post-paid, $5.00. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, post-paid, $7.00.

MUNN & CO., PUBLISHERS,
37 PARK ROW, NEW YORK.

PATENTS,

CAVEATS, TRADE MARKS, COPYRIGHTS, ETC.

Messrs. Munn & Co., in connection with the publication of THE SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had over THIRTY-FIVE YEARS' EXPERIENCE, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Marks, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

Can I Obtain a Patent? This is the first inquiry that naturally occurs to every author or discoverer of a new idea or improvement. The quickest and best way to obtain a satisfactory answer, without expense, is to write to us (Munn & Co.), describing the invention, with a small sketch. All we need is to get the *idea*. Do not use pale ink. Be brief. Send stamps for postage. We will immediately answer and inform you whether or not your improvement is probably patentable; and if so, give you the necessary instructions for further procedure. Our long experience enables us to decide quickly. For this advice we make *no charge*. All persons who desire to consult us in regard to obtaining patents we cordially invite to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases they may expect from us a careful consideration of their plans, an honest opinion, and a prompt reply.

What Security Have I that my communications to Munn & Co. will be faithfully guarded and remain confidential?

ANSWER. You have none except our well-known integrity in this respect, based upon a most extensive practice of thirty-five years' standing. Our clients are numbered by hundreds of thousands. They are to be found in every town and city in the Union. Please to make inquiry about us. Such a thing as the betrayal of a client's interests, when committed to our professional care, never has occurred, and it is not likely to occur. All business and communications intrusted to us are kept SECRET AND CONFIDENTIAL.

For How Long is the Patent Granted? The patent is granted for 17 years, during which time the patentee enjoys the full and exclusive right to make, use, and sell the invention and grant rights, licenses, or privileges. There are no taxes to pay on a patent after it is granted in the United States. The owner is not obliged to work the patent within a specified period. The patent remains good and valid, whether it is worked or not.

The Average Time required to procure a patent is six weeks. We frequently get them through in less time, but in other cases, owing to delay on the part of the officials, the period is sometimes extended. We make a special point to forward our cases *as rapidly as possible*. We have an extensive branch house in Washington (cor. F and 7th sts.), employing a corps of skilled assistants, and we make it our special duty to watch over the cases of our clients while they are before the Patent Office. If the examining officer objects to the grant of a claim, needs personal explanations, or requires amendments, we examine the references, and make the amendments, if we deem them proper, so as to secure the allowance of our client's patent as soon as possible.

In addition to the above Service, our patron receives, gratis, a notice in THE SCIENTIFIC AMERICAN, descriptive of the merits of the new patent, giving also his name and address. We estimate that this *notice goes before half a million of readers*, without a penny of cost to our client. This publication is of immense value to the patentee in advertising his new invention, and assisting to bring it promptly to the attention of purchasers. Were he to do this printing himself, it would cost him, by the most economical method, several hundred dollars.

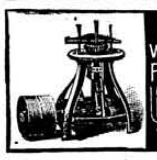
No Patent Agency in the world does so much for its clients as ours; and for that reason none so fully commands public confidence or enjoys so great a share of patronage.

MUNN & CO., 37 Park Row, N. Y.

Advertisements.

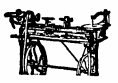
Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.



PAT. KEY SEAT CUTTER
WILL CUT 100 SEATS 4½ X ⅝ INCH PER DAY
OTHER SIZES IN PROPORTION
See Sci. Am.
VOL. 45. No 5. 181
TREVOR & CO. LOCKPORT, N.Y.

ENGINE LATHES,
Iron Planers, Iron Shapers, Drilling Machines,
ENGINES AND BOILERS,
A GENERAL LINE OF
IRON AND WOODWORKING
MACHINERY,
Tools and Supplies,
IN STORE AND TO ARRIVE.
O. L. PACKARD,
MILWAUKEE, WISCONSIN.



Champion Combination and Youth's Companion Foot Lathes, Amateur Steam Engines & Boilers, Cylinder Saws and Stave Machines. Send stamp for price. Strange's Cylinder Saw & Mach. Co. Taunton Mass.

SHIPWRIGHTS' COMPANY OF LONDON,
INCORPORATED 1612,
International Competitive Exhibition
MAY, 1882,
OF
Models of Ships of all kinds,
AT
FISHMONGERS' HALL, LONDON, ENG.

The Court of Assistants of the Shipwrights' Company have the pleasure to inform intending Exhibitors in the United States, that Messrs. Patton and Vickers, of the "Monarch" line of steamers, have most liberally offered to convey models intended for exhibition from New York to London and back, free of freight, and that all necessary arrangements may be made at their offices, 3 Bowling Green, New York. Models will be conveyed at owner's risk, but special care will be taken in handling the packages. For particulars of classification, etc., apply to ALFRED D. LEWIS, Hon. Sec.,
Fishmongers' Hall, London, Eng.

N.B.—American River Boats, Section C C; United States River Passenger or Goods Steamers; Prizes—Gold, Silver, and Bronze Medals.

50 Elegant Genuine Chromo Cards, no two alike, with name, 10c. SNOW & CO., Meriden, Conn

BEATTY'S Organs, 27 stops, 10 set reeds, only $90. Pianos $125 up. Rare Holiday inducements ready. Write or call on Beatty, Washington, N. J

12c. "A Violet from Mother's Grave," & 49 other popular Songs, words and music entire, all for 12c. PATTEN & CO., 47 Barclay St., N. Y.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS. FINE TINNING JAPANNING AND FINISHING
THOMAS DEVLIN & CO. LEHIGH AVE. & AMERICAN ST. PHILA.

C. J. GODFREY & SON,
UNION CITY, CONN.,
Manufacturers of Metallic Shells, Ferrules, Cups, Boxes, Blanks, and all kinds of small Pressed and Stamped Work, in Copper, Brass, Zinc, Iron, or Tin. Seamless Brass and Steel Ferrules for File, Chisel, and other Tool Handles. Also Inking Pad Boxes, of various kinds, for Rubber Stamps. Pocket Match Safes, and everything in the line of Metallic Notions, Small Wares, and Novelties made to order on application. Gold, Silver, and Nickel Plating when desired. Orders solicited and estimates furnished.

BAND SAW BLADES Patent Process. Send for sample saw and catalogue. H. A. KIMBALL, Agt., 614 Filbert St., Philadelphia, Pa.

DREDGING.

Tenders required by the Colonial Government, Barbados, for ten years' dredging of the Inner Harbor, to a depth of 17 feet.

Present average depth.....13 1-2 feet.
Area.....5 1-30 acres.

Plan, specification, and other information, will be forwarded by the Superintendent of Public Works, Barbados, on receipt of P. O. order for fifteen shillings.
Tenders will be opened May 1, 1882.
WALTER HELY. HUTCHINSON,
BARBADOS, Nov. 12, 1881. Colonial Secretary.

FREE TO F. A. M. Beautiful Colored Engraving, showing the Ancient Masonic Matters recently discovered in Egypt. Large new illustrated catalogue of Masonic books and goods, with bottom prices; also, particulars of the highly lucrative employment offered F. A. M. this winter. REDDING & CO., Masonic Publishers and Manufacturers, 731 Broadway, New York.

OPIUM MORPHINE HABIT. No pay till cured. Ten years established, 1,000 cured. State case. Dr. Marsh, Quincy, Mich.

70 ALL NEW STYLE CHROMO Cards, beautiful designs, name on 10c. **50** Elegant new designs, the handsomest pack ever sold, with name 10c. or 25 Extra large Chromos 10c. Gordon Printing Co. Northford Ct.

FITS Epilepsy, Spasms, etc. cured by a successful treatment. For Pamphlet with testimonials of permanent cures; address, DR. ROSS, Richmond, Ind. *A package of Medicine for trial sent free.*

MAGIC LANTERN CATALOGUE, 150 pp., 5c.
MAGIC LANTERN AND 60 VIEWS ONLY $20.
MAGIC LANTERNS and SLIDES WANTED.
WONDERFUL AUTOMATIC ORGANS, only $5.
Slides of Assassination of President Garfield a Specialty. Circulars free. THEO. J. HARBACH, 809 Filbert St., Phila., Pa.

PERFECT
NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

GET THE BEST AND CHEAPEST.
TRADE PERIN MARK.
Silver Finish.
J. A. FAY & CO.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted *superior to all others in quality, finish, uniformity of temper, and general durability.* One *Perin Saw* outwears *three* ordinary saws.

MINERAL WOOL.
This Fireproof and indestructible material successfully prevents loss of heat by radiation, keeps frost from water pipes, deadens sound, checks spread of fire in walls, partitions, floors of dwellings. 25 cts. per cubic foot.
U. S. MINERAL WOOL CO., 16 Cortlandt St., N. Y.

Spinners' and Shippers' Cotton Bale Buckle.

Serially numbered. A complete check against *fraud* in *weight* and *packing*, also, a protection in case of damage by *fire* or *water*. Only one buckle to each bale. This buckle to be the only *shipping* mark *recognized*. Made of the best *malleable iron*. Can be attached at *compress* for *immediate shipment*. It cannot be removed without disrupting the bale.
Address S. N. DRAKE,
Cincinnati, O.

PATENTS SOLD Partners Secured.
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, **733** BROADWAY, New York.

300 Choice Poetical Selections for Autograph Albums, neatly bound; 250 spicy Motto Verses, and 25 popular Songs, all for 12c., postpaid. PATTEN & WADE, 49 Barclay St., New York.

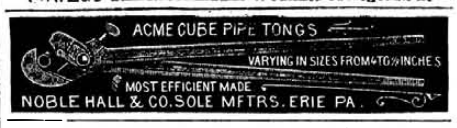
VARIABLE CUT OFF ENGINE, 25 TO 50 % SAVED IN FUEL. SIMPLE IN DEVICE. ECONOMICAL DURABLE MANF'GTD BY
BALL ENGINE CO. ERIE PA.

For Sale.—Inventor's rights of two valuable patents now being manufactured. Address J. L. O., 111 Swan St., Buffalo, N. Y.

THE BEST PAPER
for the family, young or old, is the "MAYFLOWER," Yarmouthport, Mass. Only 30c. a year. Try it.

What will the Weather be To-morrow?

A Barometer and Thermometer combined, that foretells correctly any changes in the weather 12 to 24 hours. Warranted Perfect and Reliable. We will send it, *delivered free*, to any address on receipt of One Dollar. The **Best Weather Indicator in the World.** Just the thing for a CHRISTMAS PRESENT. Agents wanted everywhere. Send for circular. *Beware of imitations.*
OSWEGO THERMOMETER WORKS. Oswego. N. Y.



INVENTORS AND PURCHASERS OF PATENTS, send for copy of "Patent Review." Models for exhibition taken free of charge. HAZELTINE & GILMAN, 178 Devonshire St., Boston, Mass.

THE BEST Drawing Paper for Maps, Plans, Mechanical Drawings, is the **PARAGON** Paper. Send for Samples.
KEUFFEL & ESSER, New York.

SPECIAL MACHINERY, TOOLS, EXPERIMENTAL Work, etc. S. MCHENRY, 927 Filbert St., Philadelphia, Pa. Fine work solicited.

Scientific American Supplement

Back Volumes and Back Numbers.

The publication of the *Scientific American Supplement* was begun January 1st, 1876. Any desired back number can be supplied. Price 10 cents each. Sold at the SCIENTIFIC AMERICAN Office, New York, and by newsdealers throughout the world. Two volumes are published annually, each of which embraces the numbers for six months, viz.: January—June; July—December.

PRICES OF VOLUMES.

Stitched in Paper Covers, each Volume.....**$2.50**
" " two Volumes.....**5.00**
Handsomely Bound in Stiff Covers, each Volume..**3.50**
" " " two Vols. together **6.00**

Remember any separate number of the *Scientific American Supplement* can be had for 10 cents; any volume for $2.50. The entire series contains all the valuable papers that have from time to time been published, including all the original articles by Alfred M. Mayer on the Minute Measurements of Science; the original instructions in Mechanical Drawing, by Prof. MacCord; the History and Illustrations of the Centennial Exhibition at Philadelphia, 1876; ditto Paris Exhibition, 1878; together with important scientific papers by the most eminent writers in all parts of the world. The yearly numbers of the *Supplement* are illustrated with about 2,000 engravings.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for *Supplement*, $5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

© 1881 SCIENTIFIC AMERICAN, INC

Founded by Mathew Carey, 1785.

BAIRD'S BOOKS FOR PRACTICAL MEN.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 96 pages, 8vo; a Catalogue of Books on DYEING, CALICO PRINTING, WEAVING, COTTON and WOOLEN MANUFACTURE, 4to; Catalogue of a choice collection of PRACTICAL, SCIENTIFIC, and ECONOMIC BOOKS, 4to; List of Books on STEAM AND THE STEAM ENGINE, MECHANICS, MACHINERY, and ENGINEERING, 4to; Lists of Books on PAINTING, VARNISHING, SIGN WRITING, DRAWING, DECORATIVE ART, etc.; ELECTRO-METALLURGY, GOLD and SILVER WORKING, WATCH and CLOCK MAKING, etc.; DISTILLING, BREWING, etc.; List of Books on MINING, MINING MACHINERY, COAL, etc., 4to; two Catalogues of Books and Pamphlets on SOCIAL SCIENCE, POLITICAL ECONOMY, BANKS, POPULATION, PAUPERISM, and kindred subjects; a Catalogue of recent additions to our stock of PRACTICAL, SCIENTIFIC AND TECHNICAL BOOKS; as well as a List of LEADING BOOKS on METAL MINING, METALLURGY, MINERALOGY, ASSAYING, AND CHEMICAL ANALYSIS, sent free to any one, in any part of the world, who will forward his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA.

TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. *Send for Catalogue*, and state *what kind* of Tools you require.
TALLMAN & McFADDEN,
607 Market St., Philadelphia, Pa.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

Print Your Own Cards, Labels, etc. Press $3. Larger Size $8.

18 other sizes For business, pleasure, old, or young. Everything easy by printed instructions. Send two stamps for Catalogue of Presses, Type, Cards, etc., to the factory.
Kelsey & Co., Meriden, Conn.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

RIDDELL'S
NEW ELEMENTS of HAND RAILING.
Revised edition, containing 41 plates. 13 of which are entirely new, with accompanying letterpress descriptions. Price $7. E. CLAXTON & CO., 930 Market St., Phila., Pa.

165 RACE ST. - JAS. MURDOCK JR. - CINCINNATI
MACHINISTS SUPPLIES IN BRASS. COPPER. GERMAN SILVER.
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS. PRICE LIST

VOLNEY W. MASON & CO.,
FRICTION PULLEYS, CLUTCHES, and ELEVATORS,
PROVIDENCE, R. I.

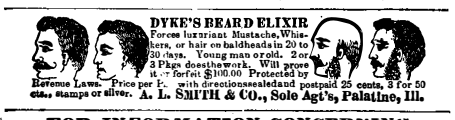
$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

HEAR YE DEAF!

CARMORE'S ARTIFICIAL EAR DRUMS
As invented and worn by him perfectly restoring the hearing. Entirely deaf for thirty years, he hears with them, even whispers, distinctly. Are not observable, and remain in position without aid. Descriptive Circular free.
John Garmore, S.W. Cor. 5th & Race Sts., Cincinnati, O.

Pamphlet Printing. Best work—lowest prices. 75c. a 12mo page for 1,000 copies. Circulars for Inventors printed very cheap.
Local Printing House, Silver Creek, N. Y.

STEEL NAME STAMPS. POSTPAID, 15 CENTS PER letter. STEEL STAMP WORKS, New Haven, Conn.



DYKE'S BEARD ELIXIR
Forces luxuriant Mustache, Whiskers, or hair on baldhead in 20 to 30 days. Young man or old. 2 or 3 Pkgs does the work. Will prove it or forfeit $100.00. Protected by Revenue Laws. Price per P. with directions sealed and postpaid 25 cents, 3 for 50 cts., Stamps or silver. A. L. SMITH & CO., Sole Agt's, Palatine, Ill.

FOR INFORMATION CONCERNING
Holly Water Works,
FOR
CITIES, VILLAGES, SUBURBAN TOWNS, FACTORIES, ETC.,
Apply to the
HOLLY MFG. CO., LOCKPORT, N.Y.
Or C. G. HILDRETH, Sec'y,
157 Broadway, New York City.

THE LARGEST
MACHINERY DEPOT
IN AMERICA.
STANDARD MACHINERY FOR ALL PURPOSES.
H. B. SMITH MACHINE CO.
ESTAB'D 1849. 925 MARKET ST. PHILADELPHIA.

HAND BLOWERS and PORTABLE FORGES made by EMPIRE PORTABLE FORGE CO., Cohoes, N. Y., are the strongest and best. Send for circulars.

PICTET ARTIFICIAL ICE.

COLD AIR MACHINES
For Brewers, Pork Packers, Cold Storage Warehouses, Hospitals, etc.
Send for ILLUSTRATED AND DESCRIPTIVE CIRCULARS.
PICTET ARTIFICIAL ICE CO. (Limited),
142 Greenwich Street,
P. O. Box 3083. New York City, N. Y.

SEND TO LONDON, BERRY & ORTON
PHILA PA FOR
THE BEST BAND SAW BLADE

WATCHMAKERS.

Before buying lathes, see the "Whitcomb," made by AMERICAN WATCH TOOL CO., Waltham, Mass.

Certificate.

CUT THIS CERTIFICATE OUT.

Upon receipt of this Certificate, on or before March 31st, 1882, with $5.00, we hereby agree to send a 9 Shot Revolver, and guarantee it in every particular, the U. S. & "DUPLEX" 9 Shot Revolver, and guarantee it in every particular.
SAXON IMPORTING CO., 116 Chambers Street, New York.

NEWLY INVENTED 9 SHOT PISTOL SHOOTS 32 & 22 CARTRIDGE

THE LATEST IN PISTOLS
DOUBLE BARRELLED
NINE SHOTS
HEAVILY NICKEL PLATED.
THIS CUT IS EXACT SIZE OF PISTOL
WEIGHT 8 OUNCES

THIS REMARKABLE WEAPON IS A PERFECT TRIUMPH OF THE GUNSMITH'S SKILL
IT IS THE *LATEST* AND *MOST USEFUL* OF ALL PISTOLS
SHOOTS 32 CALIBRE BULLETS FOR DEFENCE OR 22 CALIBRE FOR PRACTICE
THE CHANGE FROM 22 TO 32 OR FROM 32 TO 22 IS MADE IN A 1/4 of A SECOND

THE 9 SHOT WONDER ONLY $5.00/100

THE NINE SHOT DUPLEX REVOLVER.
The above illustration shows the exact size and shape of our "DUPLEX" REVOLVER, the NINE SHOT WONDER. It is the most deadly of all weapons; a remarkably ACCURATE SHOOTER and the MOST MARVELLOUS specimen of American ingenuity ever offered to the public. It is double-barrelled; one barrel is used for 32 calibre cartridges, the other for 22 calibre. The change from a 22 to 32, or from 32 to 22 can be made in a FOURTH OF A SECOND. It fires NINE SHOTS WITHOUT BEING RELOADED and as it has a Patent hinge it can be thrown open as shown in above cut and can be RELOADED IN A FEW SECONDS. The SMITH & WESSON is the only reliable revolver using a similar brake. The "DUPLEX" is made of the FINEST MATERIAL; barrels ACCURATELY RIFLED, fine KNIFE BLADE sights, ELEGANTLY ENGRAVED hard rubber handles; frame, barrels and cylinder HEAVILY NICKEL PLATED, and has a similar handle to the SMITH & WESSON 38 calibre, which is the BEST GRIP possible, and thus preventing the revolver flying up when fired. We CONTROL the MANUFACTURE AND SALE of the "DUPLEX" REVOLVER, and in order to more thoroughly introduce them we make the following SPECIAL OFFER. Upon receipt of the above CERTIFICATE and $5.00 on or before MARCH 31st, 1882, we will forward our "DUPLEX" REVOLVER to any address in the U. S., all shipping charges PREPAID, and guarantee it to reach you in PERFECT ORDER and to give you SATISFACTION OR MONEY REFUNDED. Of course we cannot make this offer general, but to place a FEW in each neighborhood as an ADVERTISEMENT, we have concluded to offer a LIMITED NUMBER at this price, it being almost the ACTUAL COST to manufacture. In order to protect ourselves from DEALERS ordering in quantities at above price, this notice will be inserted but ONE TIME in this paper, and in order for you to TAKE ADVANTAGE of the present offer you must CUT OUT the above CERTIFICATE and send to us with your order. Under no circumstances will we sell more than ONE "DUPLEX" REVOLVER at above price, and not then unless ACCOMPANIED BY CERTIFICATE. If more than one is desired they can be purchased from us at $10.00 each, that noted in our Illustrated Catalogue. We feel safe in making this LIBERAL OFFER as we know that the sale of one "DUPLEX" in your neighborhood will secure to us the sale of others, and that after securing the "DUPLEX" you will be so HIGHLY PLEASED with it, that you will exhibit it to your friends and show them at the same time our MAMMOTH ILLUSTRATED CATALOGUE of FIREARMS and SPORTMENS GOODS, which we will send you. You can thus assist us in making customers for our Company. For $1.00 extra we will send the "DUPLEX" with Ivory stock; or, for $2.00 extra we will send it with Pearl stock. The "DUPLEX" uses regular metallic cartridges which can be purchased anywhere, or we will send either 22 or 32 calibre at 25 cents per box of 50 cartridges. Look out for the cheap and worthless revolvers that have and are being advertised by numerous firms. If you are in New York at any time CALL AND SEE US, or write to any friends you may have here, have them call and satisfy themselves that the "DUPLEX" is all we claim for it, and should they wish it we will show them hundreds of letters from persons all over the country who are highly pleased with goods they have received from us. If you wish we will send the "DUPLEX" REVOLVER by Express, C. O. D., with the PRIVILEGE OF EXAMINATION on receipt of $1.00 to guarantee us against loss by express charges. When sent C. O. D. you must pay your own express charges, but as we GUARANTEE SATISFACTION OR REFUND MONEY the better way would be to send full amount when you order, as we then PRE-PAY ALL SHIPPING CHARGES and forward Revolver ON DAY ORDER IS RECEIVED. Our Company is well and favorably known throughout the country or you can find out as to our reliability by having your Express Agent write to the Express Agency of any Company running into this city, to all of whom we refer as well as any Bank in New York. Send money by Draft, Money Order, or Registered Letter. Remember the above is a SPECIAL OFFER and will not hold good after March 31st, 1882, and not more than ONE REVOLVER WILL BE SOLD WITH EACH CERTIFICATE. Address
SAXON IMPORTING CO., 116 Chambers St., New York.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
INCORPORATED 1880. (MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

Shafts, Pulleys, Hangers, Etc.

Full assortment in store for immediate delivery.
WM. SELLERS & CO.,
79 Liberty Street, New York.

THE BAKER BLOWER.
[FORCED BLAST.]

The revolving parts are all accurately Balanced.
Warranted Superior to any other.
WILBRAHAM BROS,
No. 2318 Frankford Avenue
PHILADELPHIA, PA.
SEND FOR OUR CATALOGUE.

MACHINERY

of every description. 121 Chambers and 103 Reade Sts., New York, THE GEORGE PLACE MACHINERY AGENCY.

SKINNERS PATENT COMBINATION CHUCK
UNIVERSAL, INDEPENDENT AND ECCENTRIC
ALL PARTS ARE MADE INTERCHANGEABLE
BY SLIDING THE STUD C, THE CHUCK CAN INSTANTLY BE CHANGED FROM UNIVERSAL TO INDEPENDENT & VICE VERSA
UNION MFG. CO. NEW BRITAIN CONN. SOLE MANUFACTURERS.
WAREHOUSE 96 CHAMBERS ST. NEW YORK.

$777 a Year and expenses to agents. Outfit free. Address P. O. VICKERY, Au usta, Me.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Me

PATENT
COLD ROLLED SHAFTING.

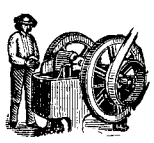
The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS,
Try Street, 2d and 3d Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

WATER ELEVATOR, OR STEAM JET PUMP.

For Pumping Hot, Cold, or Dirty Water, Lye, Tan Liquor, Acids, Slops, etc., this Pump is durable, effective, economical, reliable, and low priced. With 50 lb. steam a 1 in. $8.50 pump raises 300 gal. per hour, 50 ft. high. With 55 lb. steam a 2 in. $16 pump raises 2,100 gal. per hour 50 ft. high. Ten sizes, ¾ to 6 inch. Cheapest *reliable* Steam Fire Pump made. State for what purpose wanted, and write for prices, etc.
VAN DUZEN & TIFT, Cincinnati, O.

TEXAS
ARKANSAS AND LOUISIANA.
CHEAP HOMES FOR ALL!
50,000 Laborers can get Immediate Employment, at Good Wages, on Farms and Railroads in Texas alone.
THE SOUTH-WESTERN IMMIGRATION CO.
Will mail on application, free of cost, postage prepaid, books with maps, giving reliable information of Texas, Arkansas, or Western Louisiana. Address P. G. DUVAL, Sec'y, Austin, Tex.

ELEVATORS, Steam and Hand Power. CLEM & MORSE, 411 & 413 Cherry St., Phila., Pa., and 108 Liberty St., New York.



ROCK BREAKERS AND ORE CRUSHERS.

We manufacture and supply at short notice and lowest rates, Stone and Ore Crushers containing the invention described in Letters Patent. issued to Eli W. Blake. June 15th, 1858, together with NEW AND VALUABLE IMPROVEMENTS, for which Letters Patent were granted May 11th and July 20th, 1880. to Mr. S. L. Marsden. All Crushers supplied by us are constructed under the superintendence of Mr. Marsden, who, for the past fifteen years, has been connected with the manufacture of Blake Crushers in this country and England.
FARREL FOUNDRY AND MACHINE CO., Manufrs., Ansonia, Conn.
COPELAND & BACON, Agents, New York.

FOUND

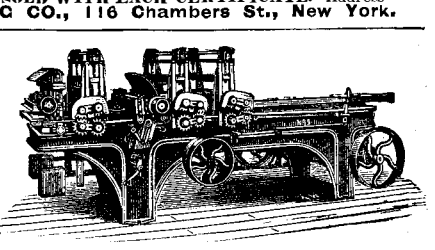
THE STEAM PUMPS MADE BY
VALLEY MACHINE CO.,
EASTHAMPTON, MASS.,
Are the best in the world for Boiler Feeding and other purposes.

AJAX METALS

ANTI FRICTION METALS TOUGH & HOMOGENEOUS
FOR LOCOMOTIVE BOXES
JOURNAL BEARINGS, COCKS, VALVES & FITTINGS FOR CHEMICAL WKS. SOLD IN INGOTS OR CASTINGS.
THE ELKINS MANF'G. & GAS CO. 617 & 619 ARCH ST. PHILADELPHIA

WOODWORKING MACHINERY,

For Railroad Shops, Planing Mills, Car Builders, Cabinet, Carriage, Sash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 172 High St., Boston; 91 Liberty St., N. Y.; 61 S. Canal St., Chicago.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

CARY & MOEN
STEEL WIRE OF EVERY DESCRIPTION & STEEL SPRINGS.
234 W. 29. ST. NEW YORK CITY

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY,
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.

This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.

(Descriptive catalogues forwarded on application.)

Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.

Information furnished upon application.

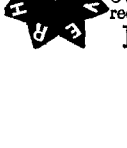
Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

THE WHITE IS KING.

It has the finest finished wood-work and is the BEST MADE MACHINE in the market. Its shuttle is self-threading; its needle can be set in or out without removing its bobbins. So simple in construction and light-running, that a child can use it. It is WARRANTED FOR FIVE YEARS. Agents can make more money handling the "White" than any other. Address, for particulars,
WHITE SEWING MACHINE CO. CLEVELAND, OHIO.

ASTHMA Quickly and Permanently CURED

Dr. Stinson's Asthma Remedy is unequaled as a positive Alterative and Cure for **Asthma and Dyspepsia,** and all their attendant evils. It does not merely afford temporary relief, but is a permanent cure. Mrs. B. F. Lee, of Belmore, O., says of it: "*I am surprised at the speedy effects of your remedy. It is the first medicine in six years that has loosened my cough and made expectoration easy. I now sleep all night without coughing.*" If your druggist does not keep it, send for treatise and testimonials to
H. P. K. PECK & CO.,
853 Broadway, New York.



DO YOUR OWN PRINTING
Presses and outfits from $3 to $500
Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

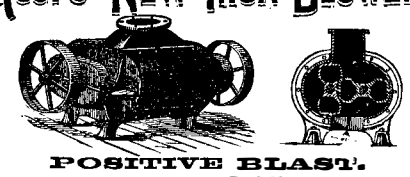
© 1881 SCIENTIFIC AMERICAN, INC

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

ROOT'S NEW IRON BLOWER.



POSITIVE BLAST.

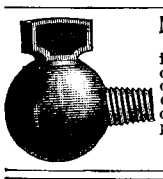
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortland St., 8 Dey St.,
COOKE & CO., Selling Agts., 6 Cortland Street,
JAS. BEGGS & CO., Selling Agts. 8 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

CLARK'S RUBBER WHEELS.
This Wheel is unrivaled for durability, simplicity, and cheapness. Adapted for Warehouse and Platform Trucks, Scales, Heavy Casters, and all purposes for which Wheels are used. Circular and Price List free. GEO. P. CLARK, Windsor Locks, Ct.

NEW YORK BELTING AND PACKING COMPANY
THE **CAR & WAGON SPRINGS**
Made by our processes are thoroughly efficient and practically indestructible.
37 & 38 PARK ROW, NEW YORK.

FOR SALE OR RENT.

Old established Foundry, Machine Shop, and Planing Mill. Excellent locality. Plenty of work. Address L. M. NEWBURY, Sparta, Wis.



New and Valuable Oiler for Loose Pulleys.
Its use on Loose Pulleys will prove it to be efficient, keeping the pulley oiled from three to four weeks with one filling. Price from 25c. to 75c. each. Sample sent by mail on application. Give diameter and speed of pulley. Send for catalogue, etc.
VAN DUZEN & TIFT,
Cincinnati, O.

H.W.JOHNS'
ASBESTOS
LIQUID PAINTS

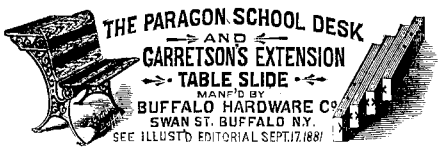
ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.

Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

DRAUGHTS
MEN'S SENSITIVE PAPER
BLUE PROCESS
ALSO IN ROLLS 50 YDS LONG
18 X 22 PER DOZ. 60 CTS.
24 X 36 " " $1.25
27 X 40 " " $2.00
SEND FOR QUOTATIONS FOR OTHER SIZES. A LIBERAL DISCOUNT TO LARGE USERS
THOS. H. McCOLLIN PHOTOGRAPHIC SUPPLIES PHILA. PA.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

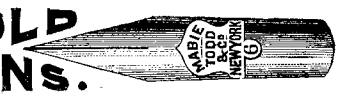


Steel Castings

From ¼ to 15,000 lb. weight, true to pattern, of unequaled strength, toughness, and durability. 15,000 Crank Shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other Steel Castings. Send for circular and price list.
CHESTER STEEL CASTINGS CO.,
407 Library St., Philadelphia, Pa.

AGENTS can now grasp a **fortune.** Address RIDEOUT & CO., 10 Barclay St., N. Y.

GOLD PENS.

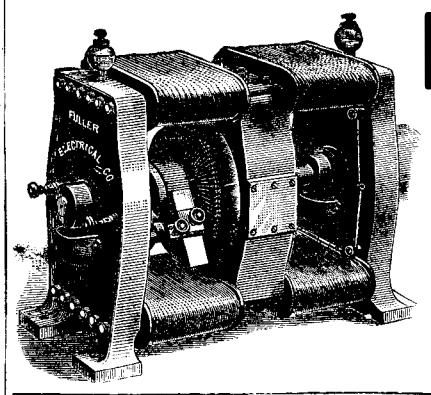


PENCILS, HOLDERS, CASES, &c.
The CALLI-GRAPHIC Pen.
A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.
MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

FIRE BRICK. TILE AND CLAY RETORTS ALL SHAPES.
BORGNER & O'BRIEN.
23 RD ST. ABOVE RACE. PHILADELPHIA.

Jarvis Furnace Co.

Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York; No. 709 Market St., St. Louis; No. 18 Second St., Baltimore.



ELECTRIC LIGHT.

THE FULLER ELECTRICAL COMPANY, having perfected their system of Electric Lighting, are prepared to furnish the **Improved Gramme Dynamo Electric Machines and Electric Lamps,** either for single lights or for from 2 to 20 lights in one circuit.

This apparatus is unexcelled for **durability, steadiness of light,** and **economy of power,** and **requires less attention than any other.**

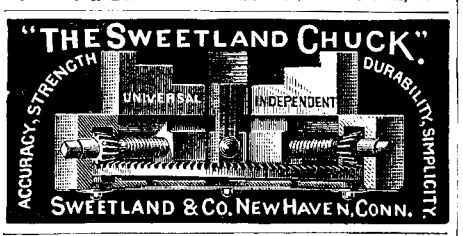
For price list and further particulars, apply to

THE FULLER ELECTRICAL COMPANY,
44 East Fourteenth St eet, NEW YORK.

THE
Hancock Inspirator,

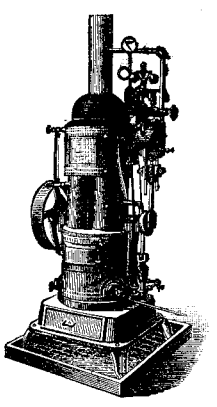
THE BEST BOILER FEEDER KNOWN.
Over 22,000 in use on Locomotive, Stationary, Marine, and Portable Boilers.
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

DROP HAMMERS.
STILES & PARKER PRESS CO., Middletown, Ct.



ERICSSON'S
New Caloric Pumping Engine

FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors
No. 10 Cortlandt Street, New York, N. Y.



ESTABLISHED 1844.
JOSEPH C. TODD,
ENGINEER and MACHINIST.

Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, Steam Engines, Boilers, etc. Sole agent for Mayher's New Patent Acme Steam Engine and Force Pump combined. Also owner and exclusive manufacturer of

The New Baxter Patent Portable Steam Engine.

These engines are admirably adapted to all kinds of light power for driving printing presses, pumping water, sawing wood, grinding coffee, ginning cotton, and all kinds of agricultural and mechanical purposes, and are furnished at the following low prices:

1 Horse Power,	$150	1½ Horse Power,	$190
2 Horse Power,	245	2½ Horse Power,	275
3 Horse Power,	290	4 Horse Power,	350

Send for descriptive circular. Address
J. C. TODD, Paterson, N. J.,
Or No. 10 Barclay St., New York.

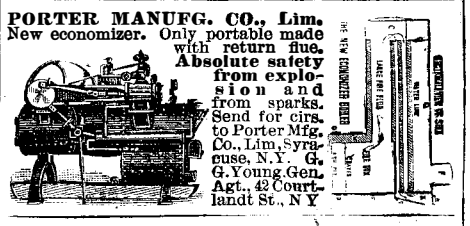
FRIEDMANN'S PATENT
EJECTORS

Are the cheapest and most effective machines in the market for

Elevating Water and Conveying Liquids,

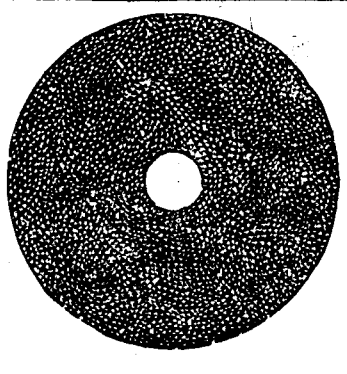
from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.

PORTER MANUFG. CO., Lim.
New economizer. Only portable made with return flue. **Absolute safety from explosion** and from sparks. Send for cirs. to Porter Mfg. Co., Lim., Syracuse, N.Y. G. G. Young, Gen. Agt., 42 Courtlandt St., N Y



IRIDIUM:
THE HARDEST METAL KNOWN.
Not attacked by acids or alkalies; not oxidized in the air; almost infusible. Manufactured under n Holland's pr ess (patented May 10, 1881) by
THE AMERICAN IRIDIUM CO.,
S. E. Corner Pearl and Plum Sts, Cincinnati, Ohio.

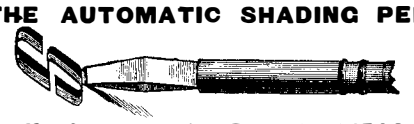
SPECTACLES Thermometers, Opera Glasses, Microscopes, Barometers, Telescopes, and Compasses. R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa. Send for Illustrated Priced Catalogue.



Lehigh Valley Emery Wheel Co.,
LEHIGHTON, PA.,
MANUFACTURERS OF
EMERY AND CORUNDUM WHEELS,
AND GRINDING MACHINERY.

For Sale by COOKE & CO., No. 6 Cortland St., New York; R. M. REXFORD, No. 11 N. 6th St., Philadelphia, Pa.; M. F. PERRY, No. 43 South Canal St., Chicago, Ill.; FOX, CORBY & CO., No. 312 North Third St., St. Louis, Mo.; BERRY & PLACE MACHINERY CO., 323 Market St., San Francisco, Cal.

THE AUTOMATIC SHADING PEN



MAKES A SHADED MARK OF TWO COLORS AT A SINGLE STROKE. SAMPLE SET OF 3 SIZES BY MAIL $1. CIRCULAR AND SAMPLE WRITING FREE.
J. W. Stoakes, Milan, O.

Estab'd **EAGLE ANVILS.** 1843.
Solid **CAST STEEL** Face and Horn. **Are Fully Warranted.** Retail Price, 10 cts. per lb.

WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.

DRUNKENNESS And the **OPIUM Habit** CURED
By LESLIE E. KEELEY, M.D., Surgeon, C. & A. R. R. Dwight, Ill. Books Free.

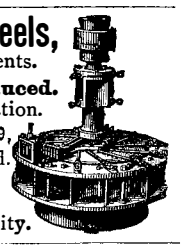
SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

COE BRASS MFG. CO.
BRASS AND COPPER IN SHEETS
TORRINGTON. — CONN.
MATERIALS FOR METALLIC AMMUNITION A SPECIALTY.
WIRE AND BLANKS

"The 1876 Injector."

Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.
WM. SELLERS & CO., Phila.

Leffel Water Wheels,
With recent improvements.
Prices Greatly Reduced.
8000 in successful operation.
FINE NEW PAMPHLET FOR 1879, Sent free to those interested.
James Leffel & Co.,
Springfield, O.
110 Liberty St., N. Y. City.



HOPE FOR THE DEAF
Dr. Peck's Artificial Ear Drums

PERFECTLY RESTORE THE HEARING and perform the work of the **Natural Drum.** Always in position, **but invisible to others.** All Conversation and even whispers heard distinctly. We refer to those using them. Send for descriptive circular with testimonials. Address,
H. P. K. PECK & CO., 853 Broadway, New York.

ROCK DRILLS & AIR COMPRESSORS.
INGERSOLL ROCK DRILL CO.,
1 PARK PLACE NEW YORK.

Prevent Accidents *from slipping.* The handsomest and safest carriage step made. Forged from best iron and formed with a sunken panel, in which is secured a plating of *richly moulded Rubber.* Durability warranted. Illustrated circular free.
RUBBER STEP MANUFACTURING CO., Boston, Mass.

KORTING UNIVERSAL
Double Tube Injector,
FOR BOILER FEEDING.
Send for Circular.
OFFICES AND WAREROOMS:
Phila.—12th & Thompson Sts. New York—109 Liberty St.
Boston—7 Oliver St. Chicago—84 Market St.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE, N.Y.

Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.

To any suffering with Catarrh or Bronchitis who earnestly desire relief, I can furnish a means of Permanent and Positive Cure. A Home Treatment. No charge for consultation by mail. Valuable Treatise Free. "His remedies are the outgrowth of his own experience; they are the only known means of permanent cure."—*Baptist.*
Rev. T. P. CHILDS, Troy, O.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

PROSPECTUS
OF THE
Scientific American
FOR 1882.
The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of THE SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
37 Park Row, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Philadelphia, and 59 Gold St., New York.

© 1881 SCIENTIFIC AMERICAN, INC